

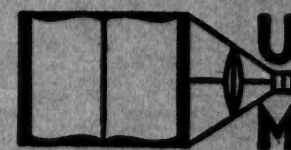
Vol. XVI

No. 7

DISSERTATION ABSTRACTS

*ABSTRACTS OF DISSERTATIONS AND
MONOGRAPHS IN MICROFORM*

UNIVERSITY MICROFILMS
ANN ARBOR, MICHIGAN: 1956



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INTRODUCTION

This year for the first time *Dissertation Abstracts* will carry, as the 13th issue of Volume XVI, an index to all doctoral dissertations published in the United States and Canada. This issue will be titled *Index to American Doctoral Dissertations*, and will be a continuation of *Doctoral Dissertations Accepted by American Universities*.¹ The joining of these two reference works makes it possible for librarians to have an integrated bibliographical research tool relating to doctoral dissertations under one cover.

Dissertation Abstracts will continue to provide abstracts of dissertations by recipients of doctoral degrees from graduate schools cooperating with University Microfilms in the publication of complete dissertation texts on microfilm, on Microcards, or as microprint. At the end of each abstract will be found an indication of the number of pages in the original typescript and the Library of Congress card number, for the convenience of scholars and research workers. In some instances *Dissertation Abstracts* will be found to be an adequate substitute for the published dissertations.

The *Index to American Doctoral Dissertations* will be a complete indexed listing of dissertations by students who were granted doctoral degrees during the previous academic year, and including those abstracted in *Dissertation Abstracts*, arranged by degree-granting institutions under appropriate subject headings. An alphabetical author index will be included.

The tabular material which has been an established part of its predecessor volume will be included in full, so arranged that statistical summaries can be maintained with no break in continuity.

It is hoped that those who use *Dissertation Abstracts* will continue to make suggestions for its improvement, as these are vital to its continued life and growth. Several suggestions for changes in the headings used for indexing purposes have been received, and a committee of the Association of Research Libraries is reviewing the indexing system at the present time as a result of these suggestions.

¹Arnold H. Trotter and Marian Harman, (eds.), *Doctoral Dissertations Accepted by American Universities*. (New York: H. W. Wilson Co., 1933-1955.)

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AGRICULTURE

AGRICULTURE, GENERAL

EFFECT OF SOME SYNTHETIC POLYMERIC COMPOUNDS ON SOIL AGGREGATE STABILITY AND ON YIELD AND COMPOSITION OF PLANTS

(Publication No. 16,694)

Robert Elman Warnock, Ph.D.
Rutgers University, 1955

Seventeen polymeric compounds produced by Rohm and Haas Chemical Company were evaluated as to their ability to stabilize soil aggregates. On the basis of the increased resistance of treated aggregates to slaking when wet-sieved, five of these were selected for further study. Conditioners identified by the trade names Krilium, Granuloam, and Loanium were also studied.

Trials were conducted in greenhouse and field to determine the effects of conditioners in crust prevention. Results indicated that solutions containing about .5 per cent conditioner were capable of reducing crust formation and aiding seedling emergence when applied as a fine spray to the surface of a well prepared seed bed.

In field trials in which the surface 6 inches of soil was treated with conditioners at .1 per cent, yields of vegetable crops were found to be increased in some cases but not in others.

Chemical analysis of plant tissue grown on treated soil indicated that, in general, the tissue composition reflected only the cations or other plant nutrients added to the soil with the conditioner. There was no evidence that the polymer itself, or the change in soil aggregation caused by its addition had any effect on plant composition. In general, the conditioners containing Na increased the Na content of plants, decreased appreciably the K content, and slightly reduced the Ca and Mg contents. In one study table beets grown on Collington sandy loam treated with conditioners were found to have suffered from Mg-deficiency, apparently induced by the competition created by the cations added with the soil conditioners.

The increased stability of aggregates from treated soil was found to last for only one year on Collington sandy loam under overhead irrigation and intense cultivation. Other studies indicated that the increased aggregate stability would persist for about 4 years following application of conditioners.

136 pages. \$1.80. Mic 56-1875

CHEMICAL AND MINERALOGICAL PROPERTIES OF TWO GRAY-BROWN PODZOLIC SOILS FROM THE VIEWPOINT OF PEDOLOGY

(Publication No. 16,698)

Michael Andrew Zwarich, Ph.D.
Rutgers University, 1955

This study deals with the chemical and mineralogical properties of the clay fractions and the sand separate of two gray-brown podzolic soils, Hagerstown silt loam and Sassafras sandy loam.

Samples of soil from each horizon of the two profiles were separated into the sand, silt and clay separates by gravity sedimentation with subsequent decantation and with an International centrifuge. The clay separate was further fractionated into three size ranges, 2-1 μ , 1-0.3 μ , and <0.3 μ , with a Sharples supercentrifuge. To ascertain the quantity of the various separates and fractions in each horizon of the two profiles, a particle size analysis was performed with the pipette and the pipette and centrifuge method.

After the fractionating procedure the following analyses were made:

1. Chemical analyses of the clay fractions for eight elements, expressed as oxides: SiO₂, TiO₂, Fe₂O₃, Al₂O₃, CaO, MgO, K₂O, and CuO. Silica and titanium were determined by the gravimetric and colorimetric procedure, respectively; aluminum, iron, calcium, magnesium, and copper were determined with a spectrograph; and potassium was determined with a flame photometer.

2. X-ray and differential thermal analyses of the clay fractions.

3. Petrographic analysis of the light and heavy mineral fractions of two size-grades of sand.

Significant variations in the chemical composition appear among the three clay fractions of the two profiles, the variations being most striking in the Hagerstown profile. The chemical composition of the 2-1 μ and 1-0.3 μ clay fractions of the Hagerstown profile is significantly different from that of the corresponding clay size fractions of the Sassafras profile, whereas the chemical composition of the <0.3 μ clay fraction is virtually the same in the two profiles.

X-ray and differential thermal data show illite and muscovite to be the dominant clay minerals in the 2-1 μ fraction of the Hagerstown profile, whereas kaolinite is dominant in the <0.3 μ fraction. The Hagerstown 1-0.3 μ fraction is somewhat intermediate in mineralogical composition between the 2-1 μ and <0.3 μ fractions. On the other hand, the X-ray and differential thermal data show that the Sassafras clay fractions consist mainly of the kaolin and illite clay minerals, the former perhaps being more dominant than the latter, particularly in the <0.3 μ fraction.

The petrographic analysis of the light and heavy mineral fractions clearly indicate different mineral suites in the respective fractions of the Hagerstown and Sassafras

profiles. The latter exhibits a much greater variety of light and heavy minerals.

The general conclusions are:

1. Chemical and mineralogical data indicate that the two soil profiles were exposed earlier to laterization effects, and have since been altered by the podzolization process.
2. The high base status of the Hagerstown clay fractions undoubtedly retards the podzolization process, whereas the low base status of the Sassafras profile favors the same process.
3. Fractionating the soil into the mechanical separates and fractions revealed certain inherent, specific features which are not ordinarily apparent through the analysis of the whole soil.

109 pages. \$1.50. Mic 56-1876

AGRICULTURE, ANIMAL CULTURE

EFFECT OF FEEDING VARIOUS LEVELS OF CHLORTETRACYCLINE DURING CONDITIONS OF NATURAL AND ARTIFICIAL STRESS UPON EGG PRODUCTION, EGG QUALITY, AND THE ANTIBIOTIC POTENCY IN EGGS AND MEAT

(Publication No. 16,874)

Mahmoud Ahmed Assem, Ph.D.
Kansas State College, 1956

These studies were initiated to determine, first, the response of laying hens to different levels of chlortetracycline (CTC) under conditions of natural and artificial stress, and second, to test for the keeping quality of clean and dirty eggs and to test for the antibiotic potency in the meat and eggs to determine if the antibiotic of the feed was transmitted to the meat or eggs.

The first phase involved three experiments using White Leghorn pullets. Percentage production, feed efficiency, egg weight, and percentage shell were determined. In Experiment I, 400 birds were divided into four lots. The nutritional level of 10 g CTC per ton of feed was supplied continuously to the two types of rations used. The level of 200 g was supplied for five days intermittently in Lots 2 and 4. In Experiment II, 36 birds were placed in individual compartment batteries in a basement room and subjected to the conditions of natural stress. The birds were assigned into six lots, and the antibiotic was fed continuously at the levels of 0, 10, 50, 100, 200, and 500 g per ton of feed. In Experiment III, the birds were subjected to imposed stress conditions for 28-day periods, and kept in batteries which accommodated 72 birds divided into six lots. The main stress used, after moving the birds to the batteries, was obtained by raising and lowering the temperature from 60° F. to 90° F.

In the second part, bacteriological spoilage was determined on clean (unwashed) eggs, and on artificially dirtied eggs gathered from Experiment I, three days following the addition of the level of 200 g CTC in the ration of Lots 2 and 4. The clean (unwashed) eggs were broken-out and organoleptically tested for bacteriological spoilage after 12 and 16 weeks of storage in the egg cellar at 55° F. The

same test was conducted on the artificially dirtied eggs after 4 and 8 weeks storage. The meat and eggs were assayed for the amount of CTC transmitted from the feed to the eggs and meat of birds. Some of the factors affecting the assay technique and the antibiotic potency were studied.

Under conditions of imposed stresses over the 10 periods, the antibiotic gave favorable results especially with the levels of 200 g CTC per ton of feed, followed by the continuous level of 10 g per ton. Over the first four periods, the level of 500 g CTC per ton of feed gave the best results, followed by the level of 200 g per ton. There was little difference in percentage production with these two levels.

The level of 200 g CTC per ton of feed seemed to be the most efficient level when used for the first four periods or the 10 periods of Experiment III. Beneficial results were obtained also from the antibiotic supplementation under stress conditions in the case of egg weight and percentage shell.

It was observed that the addition of levels of 10 or 200 g CTC per ton of feed had no effect upon the development of bacteriological spoilage in eggs. The antibiotic was detected in the meat of some birds when it was added at the level of 200 g per ton of feed for longer periods. No antibiotic was detected in the eggs with the most sensitive microbiological assay presently available.

153 pages. \$2.05. Mic 56-1877

AGRICULTURE, PLANT CULTURE

FRACTIONATION OF TOTAL SUPPLIES OF NITROGEN, PHOSPHORUS AND POTASSIUM IN CERTAIN KANSAS SURFACE SOILS AND SUBSOILS AND THEIR EFFECT ON THE YIELD AND COMPOSITION OF WHEAT

(Publication No. 16,876)

Mahendra Singh Bhangoo, Ph.D.
Kansas State College, 1956

A study, which involved the following virgin surface and subsoil materials, Labette, Cherokee, Neosho, Parsons, and Bates from southeastern Kansas, Geary from Manhattan, and Lancaster from Ellsworth County, Kansas, was established to evaluate the total supplies and different forms of nitrogen, phosphorus and potassium and their effect on the yield and composition of wheat in relation to fertilizer applications.

This investigation was designed as a complete factorial experiment in which each soil type and depth was considered as an individual completely randomized block design. The treatments applied to each soil were: (1) no treatment, (2) N, (3) P, (4) K, (5) NK, (6) PK, (7) NP, and (8) NPK.

The results from soil analyses can be summarized as follows:

Soils from southeastern Kansas were generally medium in organic matter content; however, Parsons and Bates contained considerable organic matter.

Geary soil contained much organic matter and Lancaster very little of this substance.

Total nitrogen, organic phosphorus and cation exchange capacities on all soils were positively correlated with organic matter content.

Nitrification rate was reduced in acid soils and was high in near neutral soils which contained considerable organic matter.

Total phosphorus supplies were low in all the soils used in this study. The amounts of different forms of phosphorus present in the soils were in the following order: Acid soluble phosphorus < adsorbed phosphorus < organic phosphorus < Fe and Al phosphates. The solubility of these forms of phosphorus can be indicated in this manner: acid soluble > organic phosphorus > adsorbed P > Fe and Al phosphates.

Total potassium content of these soils was high. Geary soil contained twice as much potassium as did the other soils. Non-exchangeable K generally was higher in subsoils than in surface soils. However, Lancaster surface soil contained more non-exchangeable than Lancaster subsoil. Exchangeable K in each surface soil was higher than in the corresponding subsoils.

Results of yield and composition of wheat affected by the application of fertilizer material can be summarized as follows:

In general, yield of wheat was increased by the application of PK, NP and NPK treatments with most soil

materials. Phosphorus application alone increased the wheat yields in many cases.

Wheat yields showed good response to N application alone on some soils.

Very little need of K application alone and in combination with N was indicated by wheat crops.

The effect of fertilizer materials on the yields of second wheat crop was similar to the effect of fertilizer materials on the first crop.

Application of P increased the percentage of P in grain and straw in all instances.

Nitrogen application with P increased the percentage and uptake of P in grain in many cases more so than use of P alone. Total uptake of P was increased with the increase in grain and straw yields.

Percentage of K in straw was increased as a result of addition of K. Total uptake of K was highest with treatments which yielded the most. Straw from subsoils contained less K than straw from surface soils.

Application of N to soils increased the protein content of grain. Percent of protein was higher on the treatment where N was applied in combination with K. Application of P and PK decreased the percent protein in grain in all cases. Protein content of grain for surface soils was higher than the grain from subsoils.

Percentage and total uptake of N, P, and K in wheat straw and grain of second crop was affected in a similar manner as described above for the first crop.

130 pages. \$1.75. Mic 56-1878

ANTHROPOLOGY

**PRIMITIVE PROPERTY: A STUDY OF
THE RELATIONS BETWEEN THE GENERAL
CULTURE OF SEVERAL GROUPS AND
THEIR PROPERTY RIGHTS**

(Publication No. 16,893)

Nathaniel Cantor, Ph.D.
Columbia University, 1956

For a clear understanding of "primitive property" two procedures are necessary. First, it is necessary to avoid reading Western European legal meanings of property into the data of non-literate societies. Affirmatively stated, it is necessary to make the definitions of property broad enough to include any kind of property relations which might be discovered in earlier societies. The categories developed by Prof. Hohfeld such as "privilege," "claim," "right," "immunity," etc., admirably fit in with this approach. These categories point to kinds and degrees of ownership without biasing the data with contemporary meanings of property.

Secondly, to obtain a clear understanding of the meanings of primitive property one must seek to understand the cultural setting of the particular area under investigation. What classes of "things" are "owned," who owns them, the basis and extent of control, are all problems relating to the meaning of "ownership" in a particular cultural setting.

Formally, similar objects may be owned by an individual or partnership or group. Functionally, the differences in the kinds of control, the claims and liabilities may be quite sharp. Thus, "ownership" with regard to land, ornaments, food, a series of intangible rights such as rank, dances, songs, names, seats, titles, etc., debtor-creditor relations, reciprocal claims and privileges in all kinds of exchanges - ownership with regard to these matters means something different in each of the areas studied, namely, the North Pacific Coast, North Africa, and New Guinea.

The meanings of primitive property are inextricably tied to the historical, social and psychological settings in which they operate.

The three areas selected for investigation reveal (as does the data on many other non-literate societies) that the "economies" of the latter are not based on the profit-wages-price system of the workings of our own society, with its technologies, business enterprises and credit system. This leads to certain implications for a comparative economies. We do not feel, however, the time is ripe for such ambitious tasks. Much more preliminary work must be done in discovering the meanings of "ownership," "production," "distribution," "labor," "exchange" and so on, in non-literate societies.

Our own contribution has been limited to making somewhat more clear the meaning of "primitive property" in several groups.

119 pages. \$1.50. Mic 56-1879

LAND AND LABOR ON KUDAKA ISLAND

(Publication No. 16,903)

Richard Warren Lieban, Ph.D.
Columbia University, 1956

A communal land system prevailed in the Ryukyu Islands until 1899, when a new land law came into effect which provided that individual title be given to plots distributed under the old system. In the years following, private ownership was generally established in the islands. Today only Kudaka, a small island off the coast of Okinawa, still retains the old land system.

This study is concerned with Kudakan land tenure as a functioning system and with the theoretical implications of the singular persistence of communal tenure on Kudaka.

Although the means of implementing the old Ryukyuan land system varied from community to community, Kudaka still retains certain features which underlay the old system and local manifestations of it. These features include: communal ownership of most farm land; apportionment of this land among *kumi*, each composed of a number of village households; grading of land according to quality, and distribution of better and inferior plots to each household; private rights in farmland for households of religious leaders of the community; and, until recently, periodic redistribution of arable plots. Therefore, in some respects, the land system of Kudaka is a last living representation of an important part of Ryukyuan culture history.

The problem of the perpetuation of communal tenure on Kudaka has been approached in terms of cultural ecology. Analysis has been directed to the adaptation of Kudakan culture to a local environment that is extremely unfavorable for farming, e.g., yields of sweet potato, the main crop of Kudaka, average only about one-third of those in the Ryukyu Islands as a whole. Therefore, Kudaka is a community primarily dependent on the sea for its livelihood, and horticultural production is supplementary.

The division of labor between the land and marine spheres of the Kudakan economy is by sex. All those engaged in marine activities, mainly fishing, are men, and with very rare exception, all those who farm are women.

The marine emphasis of the Kudakan economy apparently has a long history, and certainly has been true during the lifetime of older informants, covering the period when land tenure was being individualized in other Ryukyuan communities. The marine economy of Kudaka expanded after World War I, and, since rehabilitation of the community following World War II, Kudakan marine enterprises appear to be more profitable than before 1945, at least in terms of the increased amount of imported staple foods which families are now able to purchase.

Associated with these marine developments has been a lack of economic pressure on land. It seems probable that the supplementary nature of horticulture in the Kudakan economy had significant bearing on the original failure of private rights in farm land to take hold there after 1899. Certainly the continuance of communal tenure over the last thirty to thirty-five years is more understandable in the light of the decreasing importance of horticulture, a trend accentuated since World War II. Less and less land has been farmed, the increased food deficit being made up by food imports, particularly rice, the most desired staple food, which cannot be grown on Kudaka.

Survival of communal land tenure on Kudaka illuminates culture process with respect to the general connection between the individualization of property rights and the economic scarcity of land. Relative to this problem, a concluding analysis of the Kudakan materials, comparing them with data from a number of other Ryukyuan communities which have private tenure, indicates the variance of Kudakan developments which have led to an economic surplus of land on the island and disinterest in the individualization of land ownership there.

125 pages. \$1.50. Mic 56-1880

BACTERIOLOGY

MECHANISMS OF HYPERSENSITIVITY
TO ASPERGILLUS NIGER

(Publication No. 16,839)

Lawrence Jack Bradshaw, Ph.D.
Stanford University, 1956

Recent evidence has indicated that tuberculous hypersensitivity of the delayed type is mediated by a lipoidal constituent of the tubercle bacillary cell. This investigation was undertaken as an attempt to isolate the chemical components of the mold *Aspergillus niger* which were active in the induction of delayed hypersensitivity and to ascertain whether any of these components had functions biologically analogous to the tuberculolipid.

The general methods employed involved mechanical cellular disruption, isolation of various cellular proteins and extraction of several lipoidal materials of the fungus.

Guinea pigs were injected with various combinations of these materials and skin tested after suitable intervals to detect the development of delayed hypersensitivity. Serological and corneal tests were also carried out to supply additional correlative information.

The results of the first experiments indicated that both viable and killed conidiospores of the organism induced good levels of delayed hypersensitivity in experimental animals but that the mycelial phase of the organism was not active in this respect. All proteinaceous materials isolated from the spores proved to be about equally effective as skin test substances. Later experiments showed that the injection of spore cell wall fragments (obtained after cellular disruption) was as effective as the injection of whole spores in the induction of delayed hypersensitivity. Finally, experiments were carried out in which several lipoidal materials extracted from the spores were combined with isolated spore proteins and injected into animals

in an attempt to induce delayed hypersensitivity with the isolated materials alone. None of these combinations were effective under the conditions employed. Two lipid-containing proteins displayed some promise as sensitizing materials if injected without added adjuvant material.

It was concluded from these experiments that the spores of this organism were quite active in the induction of delayed hypersensitivity and that the components of the spore responsible for sensitization might be concentrated in the cell wall portion. It appeared that none of the extracted lipids played a role in the sensitization process under the conditions employed. Analysis of the difficulties encountered revealed that some unknown inhibitory influence may have been operative and that it was possible that the adjuvant used was responsible. It was felt that future work along these lines should be directed toward the two lipoprotein materials that displayed some promise and toward clarifying the role of the adjuvant in these experiments.

116 pages. \$1.50. Mic 56-1881

STUDIES ON ANTIBIOTIC PRODUCTION IN SOIL

(Publication No. 16,880)

Hideo Koike, Ph.D.
Kansas State College, 1956

Studies were made to determine whether an antibiotic could be produced in soil by inoculating different soils with pure cultures of antibiotic-producing microorganisms and/or by amending such soils with organic supplements. If antibiotic substances active against the root-rotting fungus, *Pythium graminicola* Subr., could be produced in soil, it would be of interest to find out whether such soils or antibiotic-containing soil solutions could be used for the control of *Pythium* root rot of sugar cane and sorghum seedlings.

The agar-streak plate method was used for testing antibiotic production *in vitro*, and 200-gram aliquots of soil maintained at 27°C and 65 per cent saturation in cotton-stoppered bottles, were used to study antibiotic-production in soil and to study the ability of different soils to support antibiotic production.

At desired intervals, the soil solutions were displaced with ethyl alcohol and tested *in vitro* against *P. graminicola* by a modified paper-disk assay method. The inhibition of contaminants in displaced soil solutions was also investigated. A new agar-plug method was developed for assaying antibiotic solutions.

Antibiotic W-S, produced in uninoculated, soybean-meal-amended Wabash silt-loam, was characterized as to its stability under different temperature and moisture conditions and solubility in different solvents. The ability of the antibiotic to control *Pythium* root rot of sugar cane and sorghum seedlings under controlled greenhouse conditions was investigated. The toxicity of antibiotic W-S to sugar cane seedlings was also observed.

A commercial product, actidione, was also studied regarding its ability to inhibit *Pythium* root rot of sugar cane seedlings and its toxicity to the plants.

Results of these studies indicated that:

1. No correlation existed between the ability of different actinomycetes to produce antibiotics *in vitro* and in soil.

2. A combination of mercuric chloride and streptomycin sulfate at concentrations of 0.625 microgram and 20.0 micrograms per 0.1 milliliter of assay solution, respectively, inhibited the growth of bacterial contaminants in the paper-disk plate assay of antifungal antibiotics.

3. A new fritted-filter-tube agar-plug method exhibited definite possibilities for quantitative measurements of antibiotic solutions, but was found less sensitive than the paper-disk plate method.

4. An actidione-producing strain of *Streptomyces griseus* Krinsky *emend.* Waksman, et al. failed to produce actidione in different soils supplemented with organic substances.

5. Different soils varied in their ability to support antibiotic production from soybean meal.

6. An antifungal antibiotic, designated antibiotic W-S, was consistently produced in a soybean-meal-amended, non-sterilized Wabash silt-loam. Maximum production was in such soil amended with 3 per cent of the organic substance. The addition of ground, young wheat plant to the soybean-meal-amended soil failed to increase antibiotic production.

7. Antibiotic W-S was found to be an antifungal antibiotic, differing in one or more characteristics from other antifungal antibiotics described in the literature. It did not inhibit growth of bacteria, but inhibited a yeast and several fungi.

The antibiotic was found to be highly soluble in water and ethyl acetate, insoluble in several other organic solvents tested; stable at 99°C, 27°C, 8°C, and -18°C; but unstable at 121°C and in the dry state at room temperature.

8. Antibiotic W-S was highly toxic to sugar cane seedlings, like actidione, and ineffective in controlling *Pythium* root rot of the seedlings.

Actidione, at concentrations of 25 and 50 parts per million, protected sugar cane seedlings from *P. graminicola*.

Sorghum seedlings were protected to a certain extent from *P. graminicola* by different dilutions of antibiotic W-S.

107 pages. \$1.50. Mic 56-1882

STUDIES ON DIFFERENCES BETWEEN VIRULENT AND AVIRULENT TUBERCLE BACILLI

(Publication No. 16,862)

Charles Tsuneo Uyeda, Ph.D.
Stanford University, 1956

The problem of the virulence of the tubercle bacillus has not been satisfactorily explained. Two series of experiments studying this problem are described in this paper. One deals with the variation in behavior of virulent, attenuated and avirulent strains of *Mycobacterium tuberculosis* in the presence of different concentrations of penicillin. Nine to ten day old cultures of several representative strains of each virulence group were standardized by Klett readings and inoculated onto liquid and agar Dubos oleic acid albumin media incorporated with different concentrations of penicillin. It was observed that virulent strains are quite resistant to penicillin, that attenuated ones are partially sensitive and that avirulent variants are almost completely susceptible. Several possible explanations for these behaviors are described.

The second series of experiments is concerned with the effect of *in vivo* oxygen tension as a possible factor determining the virulence of the tubercle bacillus. This investigation was based on the experiments of Heplar, Clifton, Raffel and Futrelle and of Guy, Raffel and Clifton in this laboratory, which showed that though both virulent and avirulent tubercle bacilli were inhibited in their respiration and growth at low oxygen tension (1% - that close to values found in animal tissues) the avirulent strains were more suppressed than the virulent ones. These observations clearly suggested that the avirulence of the tubercle bacillus might be due to its inability to utilize low concentrations of oxygen and conversely, that virulence might consist of the capacity to do this. Three experiments were performed in which guinea pigs were inoculated with avirulent strain JHB6 or with attenuated strain B.C.G. and then maintained in chambers containing a high oxygen level (50%) at normal atmospheric pressure over a period of one to eight weeks. In one experiment, the animals were first kept in a chamber with a low oxygen level (10-12%) in order to increase their hemoglobin contents. This preliminary procedure was carried out since oxygen carriage to the tissues and thus the oxygen levels in the tissues is a direct function of hemoglobin content and higher pO_2 levels could be attained than in those animals with normal hemoglobin contents. At given intervals (2, 4 and 8 weeks in Experiments I and II with avirulent strain JHB6, and 1, 3 and 6 weeks in Experiment III with attenuated

strain B.C.G.) pairs of guinea pigs in the experimental and control groups (animals maintained at room atmosphere after injection) were sacrificed and the extent of tuberculosis studied. Spleens, livers, lungs and tracheo-bronchial, axillary and iliac lymph nodes were examined for gross and microscopic changes. Weighed portions of the spleen, liver and lung were homogenized and cultured on Dubos oleic acid albumin agar plates and the number of viable units present in the various organs determined. In general, the results were equivocal; however, some indication of greater tuberculous involvement of the spleens and livers of those animals kept at the high oxygen tension atmosphere was noted, particularly in those injected with the attenuated strain B.C.G. With avirulent JHB6 strain, the reverse seemed to be the case. In some instances, greater involvement of one organ and lesser complication of another organ even in the same experimental group was noted.

An attempt to correlate the observations of the "penicillin" experiments with those of the "oxygen" experiments has been made. An hypothesis is presented which might directly link the two lines of investigation reported in this paper. The dehydrogenation systems might be involved in both cases; this is supported by observations of other investigators.

Suggestion for future investigations of this problem as well as descriptions of the materials and methods used are given. 169 pages. \$2.25. Mic 56-1883

BIOLOGY-GENETICS

BIOLOGY-GENETICS

A STUDY OF THE BREEDING BEHAVIOR
IN A GROUP OF WESTERN EWES

(Publication No. 16,878)

Arthur Wendel Gardner, Ph.D.
Kansas State College, 1956

A three-year study of the breeding behavior in a flock of approximately equal numbers of Southwest Whiteface, Northwest Whiteface and Northwest Blackface ewes was conducted to determine the occurrence of estrus and the extent of the breeding season, the extent of the lactation anestrus, and the repeatability of lambing date. The ewes were bred for fall lamb production.

Intact yearling rams of the Hampshire, Suffolk, Southdown, and Shropshire breeds were placed with the ewes during early June. After these rams were removed, vasectomized Rambouillet rams were placed with both the lactating and non-lactating ewes to ascertain the occurrence of estrus.

Records showed that considerable breeding activity occurs in all months of the year, except for a period from approximately the middle of January to the last of March. The Southwest ewes were the first to show estrus followed by the Northwest Blackface and Northwest Whiteface ewes.

During the three years, 40.3 percent of the ewes came

in heat while suckling a lamb, an average of 42 days after lambing. There was a range of 3-105 days for the period of lactation anestrus.

The repeatability study consisted of correlating three annual lambing dates. These correlations were tested for homogeneity, giving a non-significant chi-square value. The correlations were then pooled for an estimation of the repeatability of the lambing date in each year. The pooled correlation was .285**.

In 1952, 1954, and 1955 the rams were checked for semen quality and sperm motility. With the exception of a Hampshire ram and a Southdown ram that became sterile during the breeding season, all ram semen was judged to be of high enough quality to settle the ewes.

During the course of the study, pre-parturient, post-parturient, and gravid heat was observed among the ewes. Ewes and rams were also observed to exhibit specificity.

59 pages. \$1.50. Mic 56-1884

HEREDITARY AND ENVIRONMENTAL
FACTORS IN BODY BUILD: A STUDY
OF 100 PAIRS OF ADULT TWINS

(Publication No. 16,819)

Richard Hazelet Osborne, Ph.D.
Columbia University, 1956

Various body build taxonomies or indices have been derived for the purpose of describing the variations to be found in human physique. One of the most widely used of these descriptive techniques or systems is that of the somatotype. This system described the continuous range of variation in body build by three series of numbers representing the individual development in the body components, endomorphy, mesomorphy, and ectomorphy. The purpose of this investigation is to determine to what extent the variations in body build, as described by such a rating system, are under genetic influence. For this problem, as in any problem dealing with continuous and quantitative variation, the first step is to distinguish between genetic and environmental influences. In man, this is best derived through the study of twins.

The central problem in a twin study is the diagnosis of zygosity. In a study of physical characters this is a particularly difficult problem, for no diagnostic criteria should be used in establishing zygosity which may be reflected in the intra-pair difference values of the characters under examination. In the present study this requirement has been met by establishing twin zygosity on the basis of sex and extensive blood group determinations. The diagnosis of zygosity has been directed toward proving dizygosity either by a difference in sex, or a demonstrated difference in a blood group factor. By this method the dizygotic twin category is known to be correctly diagnosed, and any error which may occur can have but one direction, the inclusion of some like-sex dizygotic twins in the monozygotic twin category.

In the analysis of the data, both mean intra-pair difference values, and intra-pair variances have been calculated.

To extend interpretation of the latter, a control of unrelated individuals was obtained from college students of the same ethnic background as the twin sample. The mean intra-pair variance values were calculated to determine what the expected values would be if members of the control were paired at random. All tests of statistical significance are by the F test, based upon the mean intra-pair variance differences. To assure that the intra-pair differences were not affected by gross pathology, every twin subject was given a complete medical examination, and a careful health history was obtained.

In the analysis of the intra-pair differences for height and weight, height is found to show a strong hereditary factor, while weight variation appears to be more importantly affected by environmental factors. There is, in addition, an apparent sex influenced difference for height and weight variance. In the monozygotic twins, the female variance for stature is significantly larger than the male value, and in weight, males have the larger intra-pair variance. It appears that stature in females is more affected by environmental factors, while in males it is weight which is more subject to environmental influences. These conclusions are strongly supported by an analysis of the control data for height and weight variance.

The body build taxonomy tested, the somatotype, shows good evidence of describing genetic factors when tested simply as a numerical representation of the continuous range of difference in the three components of endomorphy, mesomorphy, and ectomorphy. Specific somatotypes, or groupings of somatotypes, are not shown to have an important genetic basis. The genetic aspect of the somatotype appears to rest primarily upon the ectomorphic component. When taken alone, ectomorphy has almost as strong a genetic factor as does the single measurement of body stature. In addition to this genetic aspect of somatotype, there is a sex influenced factor contributed by the endomorphic and mesomorphic components. In these two components it is found that the male has a larger intra-pair variance than does the female. 108 pages. \$1.50. Mic 56-1885

BOTANY

THE TAXONOMY AND ECOLOGY
OF THE GENUS FEROCACTUS

(Publication No. 16,853)

George Edmund Lindsay, Ph.D.
Stanford University, 1956

Ferocacti are commonly called barrel cacti, and occur in arid areas of Mexico and the southwestern United States. *Ferocactus* was a segregate genus of 31 species established by Britton and Rose in 1922, when they subdivided the genus *Echinocactus*. Since then five new species and one new variety have been described, and nine additional species and one variety have been transferred to *Ferocactus*, making a total of 45 species.

Britton and Rose were handicapped in their study by a

paucity of herbarium material and a lack of field observations. Also, they did not recognize infraspecific categories, which are often essential for proper evaluation and classification of natural populations. Some of the 31 original species, which were imperfectly known, subsequently have been found to be synonyms or have been transferred to other genera. A modern monographic study of *Ferocactus* to re-evaluate and organize all available data seemed desirable.

During the present investigation I reviewed the literature and visited the major cactus herbaria and botanical gardens in the United States, where type and otherwise critical specimens were studied and photographed. The major phase of my research was conducted in the field, where the plants were studied and photographed, and both herbarium and living specimens collected. A collection of

living plants was assembled for intensive observation at Stanford University. The field studies were essential for an understanding of the plants, which are poorly represented in herbaria, and for information about the variation within and among taxa. I visited all of the major cactus districts of Mexico and the United States, which required over 20,000 miles of travel by automobile and truck and 5,000 miles by boat.

In the present monograph I consider the general characteristics and evolutionary development of the Cactaceae, as well as the morphology, ecology, and taxonomy of the Ferocacti. The taxonomic treatment of each species includes its history, synonymy, description, distribution, salient ecological factors, and photographs of several specimens.

In the taxonomic treatment 20 of the 45 species which had been assigned to *Ferocactus* remain unchanged. Four species, *Ferocactus crassihamatus*, *F. johnsonii*, *F. hamatacanthus*, and *F. uncinatus* are excluded from the genus. Two names are changed because of priority, *F.*

stainesii to *F. pilosus* and *F. nobilis* to *F. recurvus*. *Ferocactus melocactiformis* is a *nomen dubium* and is replaced with *F. histrix*. Five taxa described as species are reduced to varieties, and are *F. acanthodes* var. *lecontei*, *F. acanthodes* var. *tortulospinus*, *F. gracilis* var. *coloratus*, *F. peninsulae* var. *viscainensis*, and *F. townsendianus* var. *santa-maria*. *Echinocactus victoriensis*, thought to be a synonym of *Ferocactus echidne* by Britton and Rose, is treated as a variety, *F. echidne* var. *victoriensis*. *Ferocactus rafaensis* is known only from the original description, and is discussed under imperfectly known species. I described two new species and three new varieties as a result of this study. They are *Ferocactus schwarzii*, *F. gatesii*, *F. alamosanus* var. *platygonus*, *F. wislizenii* var. *tiburoniensis*, and *F. fordii* var. *grandiflorus*.

As now constituted the genus *Ferocactus* includes a natural group of 25 species and 10 varieties, which range from the Isthmus of Tehuantepec to southern Nevada.

359 pages. \$4.60. Mic 56-1886

CHEMISTRY

CHEMISTRY, GENERAL

CONTRIBUTION TO THE PROBLEM OF NATURALLY OCCURRING TECHNETIUM

(Publication No. 16,831)

Edward Alperovitch, Ph.D.
Columbia University, 1954

Conflicting information about the existence of technetium in nature is reviewed, and the need for further experimental evidence regarding its terrestrial occurrence shown. The original cosmic abundance ratios Tc^{97}/Re and Tc^{98}/Re are estimated to be in the order of 1:1 and 1:10, respectively.

Of three available methods of detection: emission spectroscopy, mass spectrometry, and neutron activation, only the last two are found to be of sufficiently high sensitivity and specificity to permit the detection of 10^{-10} to 10^{-18} g of Tc per gram of material. A chemical procedure for the isolation of technetium from natural sources, giving decontamination factors of 10^{10} from Re, Mo, and most other elements, is shown to be a prerequisite for the application of these methods.

A procedure meeting these requirements is developed by a combination of distillation and anion-exchange chromatographic techniques.

Of six minerals examined by neutron activation for naturally occurring Tc^{98} , two yttriotantalites and a columbite gave positive results, indicating a Tc^{98} content of 10^{-9} to 10^{-15} g/g, and 10^{-10} to 10^{-16} g/g, respectively.

Since no Tc^{97} was found in 3 pre-Cambrian molybdenites, the half-life for the β -decay of Mo^{97} must be $>2.4 \times 10^{16}$ years.

119 pages. \$1.50. Mic 56-1887

1. THE STUDY OF THE COMPLEX FORMATION OF Cu(II) SALTS 2. THE CALCULATION OF THE VAPOR PRESSURE OF HCl FROM CELL MEASUREMENTS

(Publication No. 16,711)

Charles Robert Fuget, Ph.D.
The Pennsylvania State University, 1956

1. The Study of Complex Formation in Copper(II) Salts

Introduction

Attempts to explain the electrical behavior of salts of valence other than one have taken many forms, including incomplete ionization and excessive hydration. One of the more interesting of these assumes lack of dissociation or complex formation between the ions. Judging from the magnitude of the estimated dissociation constants for many of these salts, it appears that dissociation is often far from complete, even in dilute solutions. These and other measurements indicate formation of complexes, of which "neutral molecules" are the first stage. The primary objective of this work was to study the complex formation of Cu(II) salts, by measurement of conductance, transference number, and spectra.

Results

The transference numbers of $CuSO_4$ have been determined by the moving boundary method using $Cu(C_2H_3O_2)_2$ as an indicator solution. The moving boundary cell used in all the measurements was of a new design and a constant current device was added to the apparatus to increase the accuracy. The results obtained were corrected for volume changes that resulted from the electrolysis reaction. Values were obtained for solutions ranging in concentration from 0.2498 to 1.0261 N. The agreement with literature values obtained by the Hittorf method is very

good, and a comparison with values for ZnSO_4 obtained by electromotive force measurements indicates a similar behavior.

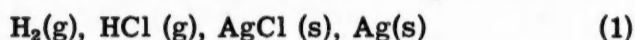
The equivalent conductance of $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$ was determined from 0.0352 to 0.653 N at 25°C . A comparison of the equivalent conductance of $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$, $\text{Cu}(\text{NO}_3)_2$, and Na_2SO_4 showed that the behavior of copper acetate is abnormal.

The ultraviolet and visible spectra of $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$ was measured at a series of concentrations and estimates made of the concentration of the several species present. Estimates indicate that the values of the extinction coefficients of the various complex species are many times, i.e. 10^3 in some cases, that of free copper(II) ion.

2. The Calculation of the Vapor Pressure of HCl from Cell Measurements

Introduction

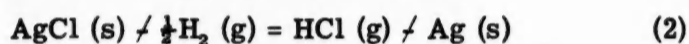
The present values available for the vapor pressures of HCl are subject to great uncertainty in the low concentration region. The need to correct these values by calculations from cell data has been strong but only recently when the question of the proper value for E_g° of the cell



was resolved by the experimental work of Aston and Gittler was it possible to do so. The object of this work was to calculate the vapor pressure of HCl at a series of temperatures and concentrations.

Results

The cell data of Harned and Ehlers from 0.01 to 3.0 m and that of Akerlof and Teare from 3.0 to 15.88 m along with the E_g° was used to calculate the vapor pressure of hydrogen chloride. The cell reaction was:



The calculations were made using the following equations:

$$E = E_g^\circ - \frac{RT}{NF} \ln \frac{f_{\text{HCl}}}{f_{\text{H}_2}^{1/2}}$$

$$\ln f_{\text{HCl}} = \frac{F}{RT} (E_g^\circ - E) \quad N = 1, P_{\text{H}_2} = 1 \text{ atm.}$$

In order to determine the error introduced by considering the fugacities to be equal to the pressures, the Berthelot equation was used to calculate the fugacity at given pressures for each temperature. For values less than or equal to a half atm. the maximum difference was 1.44 mm.

VITA

Charles Robert Fuget was born on December 15, 1929 in Rochester, Pennsylvania. He attended the Rochester Public Schools and was graduated from Rochester Senior High School in June 1947. He received a B. S. from Geneva College, Beaver Falls, Pennsylvania in June 1951. He received his M. S. in June 1953 and his Ph.D. in January 1956 from The Pennsylvania State University. His major was physical chemistry with a minor in physics.

58 pages. \$1.50. Mic 56-1888

CHEMISTRY, ANALYTICAL

KINETICS OF REACTION OF CHROMIUM(III) WITH SOME ORGANIC ACIDS

(Publication No. 16,791)

Ralph Hulet Perkins, Ph.D.
University of Utah, 1955

Chairman: R. E. Hamm

The hexaaquochromium(III) ion reacts with malonate ion in a stepwise manner to form a series of complexes. All reaction rates are first order with respect to the reacting species containing chromium(III) ion and independent of malonate ion concentration. The rate of formation of the initial complex is inverse first order with respect to hydrogen ion concentration, and the rate of formation of the dimalonatodiaquochromate(III) complex is somewhat dependent on hydrogen ion concentration, though the effect varies with the pH of the solution. The rates of formation of the trimalonate and trioxalate complexes are both essentially independent of hydrogen ion concentration. The trimalonate complex is formed at a slower rate than is the corresponding trioxalate complex, probably due to steric hindrance. The energy and entropy of these reactions were calculated using Eyring's theory of absolute reaction rates.

The reactions between chromium(III) ion and a variety of organic acid anions to form a number of initial complexes were studied. All these reaction rates are very similar, leading to the proposal of a general mechanism of complex formation between hexaaquochromium(III) ion and organic acid anions. The minor differences in reaction rates are attributed to differences in properties and structures of the various ligands.

The dimalonatodiaquochromate(III) complex was separated into its *cis* and *trans* isomers, and the kinetics of isomerization were studied. The reaction is somewhat slower than that for the corresponding dioxalate complex and is also independent of hydrogen ion concentration. Attempts to separate the optical isomers of the *cis*-dimalonatodiaquochromate(III) complex were unsuccessful. However, the enantiomorphs of the corresponding dioxalate isomer were separated, and their rate of racemization was followed. The reaction rate is first order with respect to the concentration of the optical isomer, independent of hydrogen ion concentration, and almost independent of ionic strength. The racemization rate is much slower in non-aqueous solvents than it is in pure water. The optical isomers of the trimalonatochromate(III) complex were separated, but they racemize too rapidly for the reaction to be followed.

A number of possible mechanisms for the racemization of the dichelate and trichelate complexes were illustrated; but it proved impossible, from the experimental data obtained, to choose the proper one.

111 pages. \$1.50. Mic 56-1889

CHEMISTRY, BIOLOGICAL

THE EFFECT OF TEMPERATURE OF
DEHYDRATION ON THE PROTEINS OF ALFALFA

(Publication No. 16,875)

Roy Elwin Beauchene, Ph.D.
Kansas State College, 1956

About a million tons of commercially dehydrated alfalfa are produced each year. It is generally known that heat can be beneficial or detrimental to protein quality, depending on the particular protein involved. The purpose of this research was to investigate the effect of the temperature of dehydration on the proteins of alfalfa meal and its possible effect on their nutritive value.

In order to study this problem it was necessary to develop a simple, rapid procedure for the determination of α -amino nitrogen in alfalfa meal hydrolysates. The procedure developed consisted of measuring with the flame photometer the copper complexed by amino acids. Good agreement was obtained between the flame photometric procedure and a spectrophotometric procedure.

Three alfalfa meals were prepared by subjecting freshly chopped alfalfa to different heat treatments. Low temperature meal was dehydrated at 50°C., high temperature meal was dehydrated commercially, and high temperature-pelleted meal was dehydrated commercially and pelleted. The latter sample was prepared because the meal is subjected to additional heat during the pelleting operation.

A study was made of some of the nitrogen fractions of the three meals. The total nitrogen content of the meals was the same. However, low temperature meal contained less protein nitrogen and more α -amino nitrogen than the high temperature meals. Low temperature meal contained some water soluble protein, but high temperature meal contained essentially none.

The meals were tested for native proteolytic activity, using casein as a substrate. Low temperature meal possessed proteolytic activity but high temperature meal did not. The activity was greater at pH 5.5 than it was at pH 7.0 or pH 8.4.

In vitro digestions were performed on the meals using enzymes found in the digestive tract. The combined action of pepsin, trypsin, and erepsin liberated about one-third of the protein nitrogen of the meals as α -amino nitrogen. Trypsin extended the digestion beyond that obtained with pepsin alone, but erepsin did not extend the digestion beyond that obtained with pepsin and trypsin. Blank digestions containing these enzymes in active form but without meal liberated α -amino nitrogen. Corrections were made for this liberation in order to find the amounts of α -amino nitrogen that were liberated only from the meals.

No differences in the digestibility of the meals were observed with a "high" level of pancreatin. However, with a "low" level of pancreatin low temperature meal liberated α -amino nitrogen at a faster rate than the high temperature meals. "Low" levels of pancreatin liberated α -amino nitrogen at a slightly greater rate from high temperature-pelleted meal than from unpelleted high temperature meal.

The effect of water extracts of the meals on the tryptic digestion of casein was studied. Addition of the extracts decreased the amount of α -amino nitrogen released from casein by trypsin. Autoclaving the extracts did not decrease the inhibition observed.

49 pages. \$1.50. Mic 56-1890

UPTAKE OF 2,4-DICHLORO-6-ANILINO-S-TRIAZINE
AND DERIVATIVES BY CONIDIA OF *NEUROSPORA*
SITOPHILA AND THEIR REACTIONS WITH
METABOLIC INTERMEDIATES

(Publication No. 16,800)

Harry Phineas Burchfield, Ph.D.
Columbia University, 1956

The uptake of derivatives of 2,4-dichloro-6-anilino-s-triazine by conidia of *N. sitophila* was investigated to determine mode of action and establish the relationship between physico-chemical properties and biological activity for this group. These compounds are accumulated very rapidly from dilute aqueous solution by fungus spores. Uptake reaches a maximum in from 10 to 40 minutes, after which part of the material is released back into the solution. Presumably the permeability of the cell membrane is altered, and the triazines are able to move out of the spores, perhaps in association with lipid particles. These findings were confirmed by the observation that intracellular phosphorus is released on similar treatment. When an excess of triazine is present in the aqueous phase, the period of release is followed by another period of uptake at a much slower rate, so evidently two mechanisms exist for accumulation. However, spores treated in this way are still able to germinate, so the toxicity of these compounds cannot be ascribed to their ability to alter membrane permeability. The amount of material which must be accumulated to reduce germination by 50 per cent is about 1,500 μ g. per gram of spores, or about three to six times the amount required to obtain the release of triazine and radioactive phosphorus. A considerable quantity of the material which is taken up must combine very rapidly with protoplasmic constituents since only 20 to 25 per cent of it can be recovered on immediate extraction and analysis.

The fungitoxicity of these compounds probably depends on rapid accumulation, and the ability of the active halogen atoms in the triazine ring to combine with sulfhydryl and amino groups in essential metabolites. Their order of reactivity with various substrates at pH 7.0 is sulfhydryl > secondary amino > primary amino. They do not react at measurable rates with compounds containing only hydroxyl, carboxyl, amide, and imide groups. Peptide bond formation increases the reactivity of the terminal amino group. The observation that glutathione reacts 500 times more readily than α -alanine indicates that this compound might be a primary reaction center. Inhibition of germination can be partly reversed by adding glutathione to the medium, but only at intermediate doses. At very high doses reversals cannot be obtained, indicating that secondary reactions may occur with other metabolites.

The fungitoxicity of these compounds to conidia of *N. sitophila* can be increased by substituting a chlorine atom in the *ortho*, *meta*, and *para* positions of the benzene ring in the order: *p*-chloro > *m*-chloro > *o*-chloro > unsubstituted, but their chemical reactivities with substrates such as cysteine and glycine are in the order: *o*-chloro > *m*-chloro > *p*-chloro > unsubstituted. However, these compounds are accumulated by spores in amounts proportional to their apparent toxicities. Thus the *p*-chloro isomer is 70 per cent more effective against *N. sitophila* than the *o*-chloro isomer, but on the other hand 80 per cent more of it can be accumulated by spores under identical conditions. When toxicity is measured in terms of the amount taken up per gram of spores, the two compounds

are equivalent to within 10 per cent. Evidently the primary effect of halogen substitution and isomerism is on physical affinity for the spores rather than on chemical reactivity. This may not be true for all species, since the *o*-chloro derivative is more effective against *Alternaria solani* while the reverse is true for *N. sitophila*.

76 pages. \$1.50. Mic 56-1891

THE REPARATIVE EFFECTS OF CASEIN OR AMINO ACID MIXTURES ON THE NUTRITIONAL CIRRHOSIS OF RATS

(Publication No. 16,802)

Saul Israel Cohen, Ph.D.
Columbia University, 1956

Extensive fatty and fibrotic changes in the livers of rats were consistently produced by feeding a diet low in protein (4 per cent casein) and deficient in lipotropic factors for 16 weeks. The hemorrhagic degeneration of the kidneys which occurs in weanling rats with acute choline deficiency was prevented by administering a supplement of choline chloride during the first 2 weeks of the choline deficiency. The animals were then separated into 8 sub-groups. The degree of fatty infiltration and fibrosis, based on microscopic analysis, was then determined from liver sections obtained by liver biopsy in 7 of the 8 sub-groups. The 8th sub-group was sacrificed at this time for baseline chemical analysis of total liver lipids and of collagen (as a measure of the degree of fibrosis), as well as for histologic analysis. The remaining sub-groups were then fed (1) a 30 per cent casein diet, or (2) a 4 per cent casein diet, or (3) amino acid mixtures (simulating, except for its methionine content the amino acid content of a 30 per cent casein diet) with varying amounts of methionine and/or choline.

Arrest of the fibrotic process was evident in the treated groups fed 30 per cent casein, or the various amino acid mixtures containing varying levels of methionine. Feeding the amino acid mixture containing 0.14 per cent methionine resulted in some decrease in liver fat, slight response in regard to body weight, little liver regeneration, and no regression in liver fibrosis. Animals fed the amino acid diet containing 1.05 per cent DL-methionine showed decrease of liver fat to normal, moderate growth and liver regeneration, as well as regression of fibrosis. Feeding the amino acid diet containing 1.83 per cent methionine (an amount of methionine usually occurring in 50 per cent casein) resulted in a decrease of liver fat to normal, moderate growth and regression of fibrosis, in addition to marked regeneration and restoration of liver structure. Feeding the diet composed of the amino acid mixture supplemented with 0.14 per cent methionine and 0.50 per cent choline resulted in decrease of liver lipids to normal and some regression of fibrosis; however, poor growth and little liver regeneration were noted. Those animals fed the 30 per cent casein diet showed a decrease of liver fat to normal, marked growth, marked regeneration and restoration of liver architecture, and marked regression of fibrosis.

Microscopic examination of the livers confirmed the chemical findings. The groups fed the 30 per cent casein

diet or the basal amino acid mixture containing 1.05, 1.83 or 0.14 per cent DL-methionine with 0.50 per cent choline showed a decrease in liver connective tissue when compared to the baseline control group sacrificed at biopsy or the group fed the basal amino acid mixture containing 0.14 per cent methionine without added choline.

These experiments appear to indicate that lipotropism and liver regeneration may be two distinct but related phenomena; normal liver lipid metabolism and the avoidance of excessive fat accumulation with resultant cell damage depends on the availability in the diet of factors allowing choline synthesis and utilization; liver repair and regeneration depends on the presence in the diet of those amino acids (including methionine in adequate amount) required for the synthesis of hepatic protein for cellular repair, division, and growth. The role of methionine as a lipotropic agent seems to take priority over its role as one of the many amino acids of casein involved in liver repair and regeneration.

88 pages. \$1.50. Mic 56-1892

THE METABOLISM OF AMINOACETONE AND ITS RELATION TO GLYCINE METABOLISM

(Publication No. 16,808)

Shimon Gatt, Ph.D.
Columbia University, 1956

A new pathway for the catabolism of glycine is proposed. Glycine condenses with an "active" acetate to form α -amino acetoacetic acid. This β -keto acid, on decarboxylation, yields aminoacetone. In this manner the carboxyl group of glycine gives rise to CO_2 and the α carbon atom of glycine is now the amino-carbon atom of aminoacetone.

This series of reactions is analogous to the mechanism for the catabolism of glycine which was proposed by Shemin and Russell (J. Am. Chem. Soc., **75**, 4873 (1953)). During their work on the biosynthesis of porphyrins, Shemin and coworkers have demonstrated a condensation between glycine and an "active" succinate. Shemin and Russell have shown that the product of this reaction is α -amino β -keto adipic acid which decarboxylates to δ -aminolevulinic acid. Both δ -aminolevulinic acid and aminoacetone are α -amino ketones bearing the α -carbon atom of glycine as their amino-carbon atoms.

The metabolism of aminoacetone was studied, using both aminoacetone-1- C^{14} and the non radioactive compound. The results obtained in this study are consistent with the theory formulated above.

Aminoacetone is synthesized from glycine in the rat. This was shown in a "carrier" type experiment by injecting glycine-2- C^{14} and non radioactive aminoacetone into a rat. The aminoacetone which was isolated from the urine contained C^{14} .

The amino-carbon atom of aminoacetone is oxidized rapidly to CO_2 in the rat. Fifty per cent of the radioactivity of the injected aminoacetone-1- C^{14} was recovered as C^{14}O_2 in five hours. In a similar experiment, only 10% of the injected α -carbon atom of glycine was oxidized to CO_2 . The amino-carbon atom of aminoacetone is also oxidized by rat and pigeon liver homogenates and by pigeon liver slices.

The amino-carbon atom of aminoacetone is utilized in

the rat and pigeon as a "one carbon" precursor. It is incorporated into formate (in the rat about 10% of the injected radiocarbon of aminoacetone-1- C^{14} was converted to formate in 6 hours), into the β -carbon atom of serine, methyl groups of methionine and choline, and into carbon atoms 2 and 8 of uric acid (74% of the C^{14} -activity of the uric acid molecule is located in carbon atoms 2 and 8).

The amino-carbon atom of aminoacetone is also incorporated into carbon atoms 4, 5 and 6 of uric acid, into adenine and guanine, the carbon atoms of glycine, glutamic and aspartic acids.

Labbe and Shemin have proposed that in duck blood preparations succinate and acetate compete for a condensation with glycine. From our experimental results, we expected that in the rat the glycine moiety of the condensation product of glycine with acetate would be oxidized rapidly to CO_2 , while the condensation product with succinate would not. In agreement with this we have found that succinate and other members of the tricarboxylic acid cycle decrease the oxidation of the α -carbon atom of glycine by rat liver homogenate, while acetate increases it.

50 pages. \$1.50. Mic 56-1893

STUDIES ON THE MECHANISM OF FUNGICIDAL ACTION OF N-TRICHLOROMETHYLTHIOTETRAHYDROPHthalimide (CAPTAN)

(Publication No. 16,793)

Paul Eugene Hochstein, Ph.D.
University of Maryland, 1954

Supervisor: Professor Carroll E. Cox

Manometric techniques were used to study the effect of N-trichloromethylthiotetrahydrophthalimide (captan) on the metabolism of the conidia of *Fusarium roseum* Lk. Captan inhibited the oxygen uptake of these conidia in the presence of glucose or in the presence of glucose and ammonium nitrogen. In each case, inhibition occurred over the same range of concentrations, suggesting that the primary effect of captan is on the degradation of carbohydrate. However, an effect of captan on the syntheses of organic nitrogenous compounds or the transfer of energy to these syntheses which would indirectly affect carbohydrate utilization, is not precluded. Chromatographic techniques were used to further localize the effect of captan as an inhibition of the metabolism of pyruvate. Under both aerobic and anaerobic conditions pyruvate accumulated in captan-treated conidia in large excess of that in untreated conidia. In these experiments, pyruvate was extracted and chromatographed as the 2,4-dinitrophenylhydrazone derivative. With an air-dried brewers' yeast preparation as a source of pyruvate carboxylase an inhibitory effect of captan on the decarboxylation of pyruvate was demonstrated. Cysteine, glutathione, or variations in substrate concentrations did not alleviate the inhibition caused by captan. However, its effect was reversed by addition of cocarboxylase (thiamine pyrophosphate), even after incubation of the air-dried yeast with captan prior to the addition of coenzyme. Thiamine did not reverse the inhibition. A reaction between captan and cocarboxylase *in vitro* could not be demonstrated by spectrophotometric means. Analysis

of the data showed that the inhibition is apparently of the coenzyme-competitive type. It is probable that captan affects other decarboxylation reactions requiring thiamine pyrophosphate as a coenzyme, and the data suggest that the inhibition of the growth of the conidia of *F. roseum* may result from the effect of captan on such decarboxylations.

34 pages. \$1.50. Mic 56-1894

PURIFICATION AND CHARACTERIZATION OF CYTOCHROME OXIDASE

(Publication No. 16,683)

Leon Theodore Kremzner, Ph.D.
Rutgers University, 1955

The Preparation 2-3 of Wainio *et al.* is the purest cytochrome oxidase-containing preparation reported in the literature. The main deterrent to further purification of the cytochrome oxidase of this preparation is the large amount of sodium deoxycholate present.

Two methods for removing sodium deoxycholate were investigated: dialysis and ion exchange chromatography. The deoxycholate concentration was determined by modification of an existing technique. The dialysis studies indicated that the rate of dialysis of deoxycholate, from the Preparation 2-3, was a function of the protein: deoxycholate ratio and was independent of the absolute sodium deoxycholate concentration. This method could effect only the removal of sufficient deoxycholate so that the final protein: deoxycholate ratio was 1:2. With the removal of deoxycholate, there was an increased activity of the enzyme; the activation never exceeded 79 per cent because of denaturation of the enzyme associated with prolonged dialysis.

The strongly basic resin, Amberlite XE-98 (chloride form), was found to be effective in the removal of deoxycholate. By varying resin volume and elution rate it was possible to remove any fraction of, or all of the deoxycholate present in both the Keilin and Hartree heart muscle preparation, containing sodium deoxycholate, and the Preparation 2-3. These studies demonstrated that deoxycholate is necessary for the continued solubility of cytochrome oxidase. With the removal of deoxycholate, the enzyme becomes insoluble, but not denatured. Upon reduction of the deoxycholate concentration, the protein:deoxycholate ratio increased, and the activity of the enzyme was increased, reaching a maximum at a ratio of 1:2; the activation was approximately 450 per cent.

Evidence is presented which indicates that deoxycholate forms a complex with the lipide associated with the impure enzyme, and that this is responsible for the solubilizing action of deoxycholate.

The influence of acetone, methanol, ethanol, n-butanol, and glycerol on the cytochrome oxidase of the insoluble heart muscle preparation was evaluated. A total of eight levels of addition, between 1 per cent and 50 per cent (v/v), was investigated. This study indicated that cytochrome oxidase was not extensively denatured by the addition of 30 per cent of any of the above solvents except n-butanol, which caused extensive denaturation at a 10 per cent level. None of the solvents acted selectively to separate cytochrome oxidase from the insoluble heart muscle preparation. The action of the solvents appears to be to solubilize some of the lipide associated with the impure

enzyme. Of the solvents investigated, methanol, at a 20 per cent level, appeared to be most effective.

Characterization of the Preparation 2-3 and a Preparation Methanol-2-3 (Preparation 2-3 obtained from an insoluble heart muscle preparation previously extracted with 20 per cent methanol), indicates the latter sample has less lipide associated with it. The Preparation 2-3 was 44.5 per cent lipide and the Preparation Methanol-2-3 was 18.7 per cent lipide, when analysis was based on the protein and lipide content alone. Identification of the lipides of both preparations, by paper chromatography, indicated that they are primarily lecithin and cephalin.

184 pages. \$2.30. Mic 56-1895

THE PERIODATE OXIDATION OF SOME RIBOSE PHOSPHATES AND RELATED COMPOUNDS

(Publication No. 16,852)

Luis Werner Levy, Ph.D.
Stanford University, 1956

The oxidation of ribose 5-phosphate, ribose 3-phosphate, ribitol 3-phosphate and of ribose by periodate was studied at pH 6. This pH was maintained by constant addition of standard alkali from a microburet, eliminating the use of buffer mixtures. Quantitative measurements were made of the periodate reduced and of the formic acid and formaldehyde present after the oxidation of each compound, and the phosphate-containing products were identified.

The oxidation of ribose 5-phosphate was found to involve the reduction of three moles of periodate and the formation of three moles of formic acid and of one of glycolaldehyde phosphate. The latter was characterized by enzymic dephosphorylation to glycolaldehyde, which was identified by periodate oxidation and by a modified colorimetric method, based on that of Dische and Borenfreund [*J. Biol. Chem.*, 180, 1297 (1949)]. A crystalline monobrucine salt of glycolaldehyde phosphate was prepared from α -glycerophosphate by periodate oxidation and fractionation of the reaction mixture on a Dowex 2 bicarbonate column by gradient elution with sodium bicarbonate.

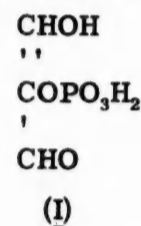
Glycolaldehyde phosphate prepared either from ribose 5-phosphate or α -glycerophosphate was examined by paper chromatography in the *tert.*-butanol-picric acid system. Evidence for two isomeric forms was found (R_f 0.38 and 0.25 respectively). The slower moving component was largely eliminated when solutions containing both were treated with Dowex 50 hydrogen before application to the paper. It reappeared when the acidic solution obtained from the Dowex 50 hydrogen treatment was neutralized and examined by paper chromatography.

Evidence for the isomerization of ribose 5-phosphate was obtained when a solution of the barium salt was heated at 100° for 100 seconds in the presence of Dowex 50 hydrogen, and the resulting solution treated with periodate. An amount of 0.23 moles of formaldehyde was found, indicating that a part of the ribose 5-phosphate had been converted to a 1,2-glycol structure containing a primary alcohol group. It was suggested that the compound formed might be ribulose 5-phosphate.

The material used for the study of the periodate oxidation of ribose 3-phosphate was a crystalline dibrucine

salt prepared in this laboratory by William F. Hain according to the procedure of Khym, Doherty and Cohn [*J. Am. Chem. Soc.*, 76, 5523 (1954)]. The specific rotation of this material was -28° , in contrast to that of -35° reported by the authors mentioned. The periodate oxidation was carried out at 2°. It was found that the production of formic acid ceased temporarily 10 minutes after the addition of periodate. At this stage of the oxidation the acid formed and periodate reduced amounted to 0.13 and 0.7 moles respectively per mole of ribose 3-phosphate originally present. Only traces of formaldehyde were found. A study of the reaction mixture, after the oxidation was interrupted, provided evidence for the presence of a labile formate ester, as an amount of acid corresponding to 0.66 moles was liberated during storage of the solution. Examination of the reaction mixture by paper chromatography before and after enzymic dephosphorylation led to the conclusion that ribose 3-phosphate and erythrose 2-phosphate were present. The formation of erythrose 2-phosphate was considered as unambiguous proof that the parent dibrucine ribose phosphate ($[\alpha]_D - 28^\circ$) was dibrucine ribose 3-phosphate.

The periodate oxidation of ribitol 3-phosphate at 2° and pH 6.8 yielded a compound showing a strong ultraviolet absorption (λ_{max} , 275 m μ , $\epsilon = 22,900$ per mole of phosphate). The reaction mixture was fractionated on a Dowex 2 bicarbonate column by gradient elution with sodium bicarbonate, and a crystalline dibrucine salt was isolated and characterized as dibrucine reductone phosphate. Reductone phosphate (I) was rapidly



hydrolyzed to reductone and inorganic phosphate by acid and alkali, but was stable at pH 5 to 6. The highly unstable nature of this phosphate ester and its similarity in structure to phosphoenolpyruvic acid suggest a possible "high energy phosphate" activity for this compound.

Oxidation of ribose with periodate at 2° and pH 6.5 yielded a complex mixture, in which reductone, erythrose, glyceraldehyde and unoxidized ribose were tentatively identified.

183 pages. \$2.40. Mic 56-1896

A BIOCHEMICAL STUDY OF THE EFFECTS OF CHORIONIC GONADOTROPHIN IN THE HYPO- AND EUTHYROID RAT

(Publication No. 16,685)

Mero Raymond Nocenti, Ph.D.
Rutgers University, 1955

This study deals with: (1) the characterization of biochemical (desoxypentose and pentose nucleic acid) differences between normal and cystic ovaries; (2) histochemical localization of the nucleic acids in the ovary; (3) the effect of the experimental conditions on the histology of the ovary and (4) the nucleic acid changes in the adrenals.

To induce the ovarian cyst formation, 30 day old rats

were fed an 0.5% thiouracil synthetic diet for 30 days and injected with 10 I.U. of human chorionic gonadotrophin on the last 20 days of the 30 day feeding period. At 0, 10, 15, 20, 25 and 30 days, animals were removed from the various groups for autopsy. The nucleic acids were determined according to the method of Schneider, a colorimetric method based on color reactions of the sugar components of the nucleic acids. Ovaries were saved for general histology, the Feulgen Reaction and basophilia staining.

The administration of chorionic gonadotrophin to hypothyroid rats resulted in cystic ovaries. These cystic ovaries were characterized by an increase in actual and relative weights. This increase was due to the cyst fluid and formation of lutein cells. The histology and histochemical results indicated that the quantitative biochemical differences noted were correlated with changes in cell number and type. Cystic ovaries were characterized by a significant increase in nucleic acid synthesis. The ovarian nucleic acid concentrations in cystic ovaries were decreased by the diluting effect of the cyst fluid. Thiouracil feeding resulted in decreased actual and relative adrenal weights. The nucleic acid concentration changes in the adrenal were brought about by the adrenal weight loss due to thiouracil feeding.

Hypothyroidism augmented the effect of chorionic gonadotrophin on the rat ovary. This augmentation was expressed by increased ovarian weight, formation of follicular cysts and increased nucleic acid synthesis. This increased synthesis indicated an accelerated growth and secretory activity of the cystic ovary.

60 pages. \$1.50. Mic 56-1897

STUDIES ON THE ESSENTIAL GROUPS OF HIGHLY POLYMERIZED DEOXYRIBONUCLEIC ACIDS

(Publication No. 16,822)

Buena Day Reiner, Ph.D.
Columbia University, 1956

The effects of various alkylating agents under mild conditions (comparable to those found in biological systems) upon free bases, free nucleotides, and highly polymerized deoxyribonucleic acids (DNA) were investigated.

The study of the derivatives of the free bases indicated that the purine bases were more reactive than the pyrimidine bases.

When DNA was treated with dimethyl sulfate (DMS), only two derivatives at most were found. Both of these were purine derivatives. Only one of these derivatives was detectable at the lowest concentration of DMS at which complete inactivation of transforming principle of *Hemophilus influenzae* occurs.

From spectrophotometric and chromatographic comparison of the derivatives with authentic methylated purines and with existing data, the compounds can be identified with reasonable certainty as 7-methylguanine and 7-methyladenine. The derivative obtained at the lower DMS concentration (0.0127 M) is 7-methylguanine.

At a concentration of diethyl sulfate (DES) which fully inactivates transforming principle, an appreciable percentage of phosphate was found to be esterified, while no derivatives of the bases were detectable.

The biological incorporation of 5-chlorouracil into DNA was investigated.

It was found that this analog to thymine is incorporated to the extent of 21 percent.

It was also found that the thymine content is lower by a corresponding amount, indicating that 5-chlorouracil actually replaces thymine in DNA.

It was concluded that the biological activity of DNA could be altered or abolished by the introduction of substituents which would sufficiently modify the distribution of charge, and would therefore affect the stability of the normal DNA structure. Such charges are the positive charge introduced at the N₇ position of the purine bases when alkylation converts it into a quaternary form, and the negative charge of the primary phosphate, which is removed by esterification. On the other hand, substituents which produce a charge distribution and steric factors not too different from those of normal DNA do not seem to affect its biological functioning. The replacement of the 5-methyl group of thymine by halogen atoms is an example of this case.

60 pages. \$1.50. Mic 56-1898

A STUDY OF THE MICHAELIS-MENTEN KINETICS OF CRYSTALLINE SWINE PANCREATIC AMYLASE AND WAXY MAIZE STARCH

(Publication No. 16,919)

John William Van Dyk, Ph.D.
Columbia University, 1954

In this investigation the kinetics of the action of crystalline swine pancreatic amylase on a branched polysaccharide was studied.

Two analytical methods were used to follow the course of the reaction. One method, based on iodometric determinations of reducing values had been modified to suit the experimental conditions. The other was a spectrophotometric technique which was based upon the absorption spectrum of the iodine - starch complexes. This method was developed especially for the determination of the initial velocity of the hydrolysis of dilute solutions of branched polysaccharides. The agreement between the two methods was satisfactory. However, since the precision of the spectrophotometric method was better, it was used for the major part of the study.

Because of the dependence of the velocity of reaction on the extent of hydrolysis all velocities were referred to a given extent of hydrolysis at 2.3⁰/. The change in velocity with substrate concentration was found to be in agreement with the mechanism of enzyme action proposed by Michaelis and Menten.

From the variation of the velocity with substrate concentration the affinity constant (reciprocal of the Michaelis-Menten constant) and the rate constant for the breakdown of enzyme substrate complex were calculated.

Enzyme concentration was shown to have little if any effect on the value of the affinity constant obtained, provided the enzyme was protected from inactivation. Inactivation was suppressed by adding calcium ion, which has been previously shown to protect the enzyme from inactivation, to the hydrolysis mixtures.

The temperature dependence of the affinity and rate constants were determined between 40⁰ and 15⁰C. The

affinity constants exhibited the temperature dependence of an equilibrium constant, while the rate constant showed significant deviation from Arrhenius behaviour in this temperature interval. This suggests that the affinity constant is probably the equilibrium constant for the formation of enzyme substrate complex.

From the temperature dependence of the affinity constant the apparent heat and entropy of enzyme substrate complex formation were calculated to be -7.1 ± 0.2 kcal. mole⁻¹ and -7.1 ± 0.8 cal. deg.⁻¹ mole⁻¹ respectively. These values are compared with those obtained for other enzyme systems. 108 pages. \$1.50. Mic 56-1899

CHEMISTRY, INORGANIC

REACTIONS OF SILICON WITH THE SILICON TETRAHALIDES

(Publication No. 16,850)

Charles Prentiss Kempter, Ph.D.
Stanford University, 1956

The high temperature reactions of silicon with the silicon tetrahalides ($\text{Si} + \text{SiX}_4 = 2 \text{SiX}_2$) were investigated as a source of purified silicon of desired crystal habit. Pure single crystals were directly produced by the careful selection of reaction conditions.

The Reactions as a Source of Silicon. Reactions of commercial silicon, and also ferrosilicon, were carried out with silicon tetrachloride. Reactions of commercial silicon were also carried out with silicon tetrabromide and with silicon tetrafluoride. In some cases, nitrogen or helium was used as a carrier gas for the silicon tetrahalide.

It was found that at a given temperature and pressure, the yield of purified silicon increases with the molecular weight of the tetrahalide used. The optimum reaction temperature for a maximum yield is that point just under the melting point of the silicon bearing material, 1415° C. for pure silicon at one atmosphere. The reactions work well at atmospheric pressure; at low pressures, the enhanced conversion to SiX_2 is offset by the decreased concentration of SiX_4 available for reaction.

Side reactions produce higher molecular weight silicon halides, which can be minimized by utilizing conditions of slow silicon formation. This tendency is greatest with the tetrachloride, and not detectable with the tetrafluoride. The use of an inert carrier gas minimizes their formation and favors the production of silicon.

The use of conditions of slow silicon formation favors the production of a purer and better crystallized product. Conditions of slow silicon formation are enhanced by decreasing temperature, increasing total pressure, decreasing molecular weight of SiX_4 , increasing diluent gas concentration, and decreasing flow rate.

Purity of the Silicon Produced. Silicon produced by the reaction of commercial silicon with silicon tetrachloride vapor at low flow rates was analyzed by emission spectrography and by electrical conductivity methods. The spectrographic purity was 99.9+%. The conductivity of the powdered material was determined in an aqueous

hydrofluoric acid medium in a powder conductivity cell. The specific resistivity of the silicon was 40-50 ohm cm. at 23° C., from which a purity of over 99.9% can be estimated.

Using silicon tetrafluoride diluted with helium, minute translucent silicon spheres were produced which possibly approach ideally pure silicon.

Crystallography of the Silicon Produced. In the reaction of silicon with silicon tetrachloride, a mixture of cubic silicon mixed with a tetragonal phase is obtained under selective conditions. The unit cell is a body centered tetragonal lattice with an axial ratio of 1.81, where $a = 3.99$ and $c = 7.22$ Å. The density of the crystalline mixture was 1.67 g./cc. at 15° C.; the mixture was not pressure sensitive. The spectrographic purity of the mixture was over 99%. When the mixture was heated to about 870° C. in vacuo, the X-ray powder diffraction pattern changed to that of cubic silicon alone. Electron micrographs revealed two distinct crystal habits in the mixture. It is possible that this tetragonal phase is a high temperature allotrope of silicon isomorphous with beta tin.

The most widely distributed crystal habit observed for the cubic silicon was the spheroid.

Under conditions of slow formation, in the presence of an inert carrier gas, acicular crystals are produced. Under conditions of very slow formation, in the presence of helium, acicular single crystals are produced. A detailed X-ray crystallographic study of these cylindrical crystals proved them to have 111 orientation along the needle axis. The resultant pseudo-cell is hexagonal with $a = 3.839$ Å, $c = 9.405$ Å, and $c/a = 2.45$, with 6 atoms per unit cell.

133 pages. \$1.80. Mic 56-1900

CHEMISTRY, ORGANIC

THE CONSEQUENCES OF SOLVENT EXTRACTION ON THE STRUCTURE AND BEHAVIOR OF THE STARCH GRANULE

(Publication No. 16,873)

Karl Altai, Ph.D.
Kansas State College, 1956

A survey of the literature indicated that the present methods of fatty-acid removal from different starches by solvent extraction were inadequate. In a few cases where the fatty-acid content was reduced to a low level, starch granules were damaged during the treatment.

One of the objects of this study was to find a solvent which would remove fatty acids from starch more effectively than the solvents now in use and leave the granular structure intact. It was believed possible to obtain an insight into the mechanism of fatty-acid removal from starches. Consequences of solvent extraction on the structure and behavior of starch were to be interpreted from viscosity characteristics and alkali-lability. It was believed that a correlation existed between the structure of the starch and its fatty-acid content.

To avoid any complications which would be present when using a commercially produced cornstarch, the starch used in this investigation was milled from corn in this laboratory.

Mild milling conditions insured a high-grade cornstarch. A commercially milled cornstarch was used for a few comparative studies.

A series of alcohol extractions were performed with methanol, ethanol, n-propanol, i-propanol, and t-butanol. A concentration range of alcohol-water mixtures from 30 to 100 per cent alcohol was explored.

A mechanism for fatty-acid removal from cornstarch was proposed. This mechanism was based on the assumption of an alcohol film between the fatty-acid molecules and the walls of the starch helices. It was suggested that the fatty-acid molecules were embedded by the hydrocarbon ends of the alcohols and that these hydrocarbon ends provided a lubricating or wetting effect to facilitate the movement of these acids inside the helices. The hydrophilic ends of the alcohols were considered to be hydrogen-bonded to the secondary alcohol groups on the glucose units in the starch.

The extent of fatty-acid removal was qualitatively correlated with the length of the alcohol molecules, their degree of branching, and their concentration. The presence of water in alcohols was found to have a significant influence on fatty-acid removal. Water was held responsible for moderating the alcohol-film density inside cornstarch helices.

Methanol which is generally used as fat-removing agent from starch was found to be the least effective extractant in the concentration range below 55 mole per cent alcohol. On the other hand, methanol was more effective than other alcohols in the concentration range above 65 mole per cent alcohol.

Viscosity characteristics for extracted starches indicated a strengthened surface structure. The alkali numbers for all extracted starches were found to be higher than those of parent starches. This indicated increased strain in the granule. Differences in alkali numbers for extracted cornstarch from one alcohol to the other were not significant.

It was noticed that alkali numbers were generally independent of alcohol concentration. Alkali numbers were also independent of extraction time beyond the initial 2-hour extraction. This suggested that all major changes in the starch structure due to the action of alcohols must have occurred during this initial period of extraction.

A distinct difference between fat-by-hydrolysis values for glutinous and nonglutinous starches was observed. This difference was correlated with the difference in the structure for the respective starches.

88 pages. \$1.50. Mic 56-1901

NITROPARAFFIN STUDIES: CONDENSATIONS OF NITROPARAFFINS WITH FORMALDEHYDE (PARTS I-IV)

(Publication No. 15,611)

Mark T. Atwood, Ph.D.
Purdue University, 1954

Major Professor: G. Bryant Bachman

The reaction of primary nitroparaffins with formaldehyde in the presence of small amounts of basic catalysts

has been found to yield γ -dinitroparaffins. Secondary alkyl amines have been shown to have catalytic activity superior to primary and tertiary alkyl amines and to sodium carbonate, although small yields were obtained using these latter catalysts. The experimental procedure usually involved refluxing a mixture of two moles of a primary nitroparaffin, one mole of paraformaldehyde, and 0.05 mole of basic catalyst for three to ten hours followed by neutralization with acid and vacuum distillation of the more volatile materials. The lower γ -dinitroparaffins were removed from the product mixture by steam distillation and the higher ones by crystallization procedures. Changes in reactant ratios, reaction temperatures and reaction times and the azeotropic distillation of the water released during the course of the reaction had little effect on the product yields. The lachrymatory odor of nitroolefin was noted in each reaction, but no nitroolefin was ever isolated. A large amount of tar was obtained in each reaction. This tar was believed to be composed largely of nitroolefin polymers.

When primary and secondary amines are used as catalysts, the reaction is believed to proceed through an intermediary Mannich base which then undergoes decomposition to a nitroolefin and the amine. The nitroolefin then either polymerizes to yield tar or undergoes a Michael condensation with a nitroparaffin anion to yield the γ -dinitroparaffin. With tertiary amine and sodium carbonate catalysts it is believed that the intermediate is the nitroalcohol which can undergo decomposition to the nitroolefin and hydroxyl ion.

In accord with this mechanism it was shown that the only product isolable from the reaction between 2-nitropropane, formaldehyde, and diethylamine was 2-methyl-2-nitropropanol which resulted from the aldol condensation of 2-nitropropane and formaldehyde. Neither this alcohol nor the corresponding Mannich base is capable of forming the nitroolefin believed to be required for the completion of the formation of a γ -dinitroparaffin.

The γ -dinitroparaffins prepared are 2,4-dinitropentane; 3,5-dinitroheptane; 4,6-dinitrononane; 2,8-dimethyl-4,6-dinitrononane; and 7,9-dinitropentadecane. All but the second compound have not previously been reported. The expected diastereomers were separated in the case of the last three compounds. The diastereomers of 7,9-dinitropentadecane were shown to be interconvertible in the presence of a small amount of n-butylamine.

82 pages. \$1.03. Mic 56-1902

I. A STUDY OF DEAMINATION IN THE PREGNENOLONE SERIES AND II. TRANSFORMATIONS IN THE BILE ACIDS SERIES

(Publication No. 16,671)

Felix Borek, Ph.D.
Rutgers University, 1956

The objective of this work has been to prepare a 20β -aminosteroid derived from pregnenolone, and to investigate its deamination products in order to establish the extent and path of the D-ring expansion.

Pregnenolone was converted to its oxime 3-acetate which on catalytic hydrogenation with platinum in acetic

acid gave 3 β -acetoxy-20 α (?)-aminoallopregnane. The tentative stereochemical assignment at C₂₀ of this compound was made on the basis of the molecular rotation differences between its 3,20-diacetate and that of a stereoisomeric amino alcohol obtained by Raney nickel hydrogenation of the oxime.

Deamination of 3 β -acetoxy-20 α (?)-aminoallopregnane with nitrous acid in 50 percent aqueous acetic acid solution (using the so-called "Demjanov reflux method") yielded a mixture of olefinic and alcoholic products. The olefinic components were separated from alcohols by adsorption chromatography on Florisil column, and the two major fractions were investigated separately.

The main olefinic fraction (15 percent of the total product) was subjected to ozonolysis. The resulting formaldehyde and acetaldehyde were isolated as dimedone derivatives, and their amounts determined gravimetrically. On this basis the olefinic fraction was found to consist in ca. 40 percent of a mixture of unrearranged pregnenes: Δ^{17} - and Δ^{20} -3 β -acetoxyallopregnene.

Two main alcoholic fractions (40 percent of the total product) gave on saponification a mixture of three diols which were partly separated and purified by successive recrystallizations. One of them was identified as allopregnane-3 β ,20 α -diol. The melting points, optical rotations and infrared spectra of this diol and its diacetate were the same as those of the authentic compounds. Chromic acid oxidation of the diol yielded a diketone which had the melting point, optical rotation and infrared spectrum identical with those of allopregnane-3,20-dione, and did not depress the melting point of the authentic compound. On the other two diols, one was isolated in a very small amount, and was found to have the melting point identical with that of uranediol (17 α -methyl-D-homoandrosterane-3 β ,17 α -diol), while the other was isolated in larger amount and found to have a melting point and optical rotation different from those of uranediol, allopregnane-3 β ,20 α -diol, and allopregnane-3 β ,20 β -diol. Similar differences were observed between the physical constants of the diacetates of the respective four diols. Since the amount of the unidentified diol in pure form was too small for an oxidation reaction, a sample containing both the unidentified diol and uranediol was oxidized with chromic acid. The resulting mixture of diketones could not be separated by fractional crystallization, sublimation or chromatography. The infrared spectrum of the mixture was found to be very similar to that of uranediol (17 α -methyl-D-homoandrosterane-3,17 α -dione). One of the attempts at fractional crystallization yielded a minute amount of solid which had a sharp melting point higher than that of uranediol, showed an infrared spectrum only slightly different from that of uranediol, and depressed the melting points of 17 α - and 17 β -methyl-D-homoandrosterane-3,17-dione. The infrared spectrum differed considerably in the "fingerprint" region from those of the two epimeric 3,17-D-homodiketones. It was concluded that the unidentified diol and the corresponding diketone most likely are 17-epimers of uranediol and uranediol, respectively.

Other fractions representing 45 percent of the product were not identified, but were found by infrared analysis to consist of unrearranged alcoholic and olefinic components including a tertiary alcohol, presumably allopregnane-3 β ,17-diol 3-monoacetate (ca. 15 percent).

To sum up, the D-ring expansion proceeded to the extent of ca. 30 percent, with the exclusive migration of C₁₆-C₁₇ bond.

103 pages. \$1.50. Mic 56-1903

APPROACHES TO THE SYNTHESIS OF STEROIDS

(Publication No. 16,676)

Walter Monroe Bush, Ph.D.
Rutgers University, 1955

A. Metalation of 1,7-Dimethoxynaphthalene

R. A. Barnes¹ first exchanged 1,7-dimethoxynaphthalene (I) with butyl lithium. When the resultant organo-lithium intermediate was alkylated with dimethyl sulfate, a crystalline product, x-methyl-1,7-dimethoxynaphthalene (II), was isolated in good yield. Since the lithium atom usually enters an aromatic nucleus at a position adjacent to the activating group, the 2-, 6-, and 8- methyl isomers were considered as possibilities for the correct structural assignment of Barnes' compound. It was felt that if this product proved to be 8-methyl-1,7-dimethoxynaphthalene (III) a suitable starting material for the synthesis of steroids would have been made readily available.

In order to prove the structure of II, it was first reduced with sodium in ethyl alcohol to yield x-methyl-8-methoxy- β -tetralone (IV). This was subjected to a Wolff-Kishner reduction and the resultant oil, x-methyl-5-methoxytetralin (V) was characterized as the ketobutyric acid derivative, β -[(x-methyl-1-methoxy-5,6,7,8-tetrahydro)-4-naphthoyl]-propionic acid (VI).

That II was not the 8-isomer was then proven by the unequivocal synthesis of β -[(8-methyl-1-methoxy-5,6,7,8-tetrahydro)-4-naphthoyl]-propionic acid (VII), starting with β -(2-bromo-5-methoxyphenyl)-ethyl-p-toluene sulfonate (VIII). When compounds VI and VII were admixed, a large depression in melting point was observed.

That II was not the 2-isomer was proven by the unequivocal synthesis of β -[(2-methyl-1-methoxy-5,6,7,8-tetrahydro)-4-naphthoyl]-propionic acid (IX), starting with 1-methoxy-5,6,7,8-tetrahydro-2-naphthoic acid (X). A 40° difference in melting point was observed between compounds VI and IX.

In order to investigate the remaining possibility, 6-methyl-7-methoxy- α -tetralone (XI) was aromatized with sulfur and the resultant naphthol was methylated with dimethyl sulfate. The product isolated, 6-methyl-1,7-dimethoxynaphthalene (XII), proved to be identical with the compound (II) isolated by Barnes.

B. Synthesis of 1-Methoxy-10-Keto-3,4,5,6,7,8,10,11,12,13,14-Decahydrophenanthrene

1,7-Dimethoxynaphthalene (I) was first reacted with succinic anhydride to yield β -(1,7-dimethoxy-4-naphthoyl)-propionic acid (XIII), which was best purified by conversion to the methyl ester. The acid was subjected to catalytic hydrogenolysis to give γ -(1,7-dimethoxy-4-naphthalene)-butyric acid (XIV).

The structure of XIV was proven by reduction to γ -(1-methoxy-7-keto-5,6,7,8-tetrahydro-4-naphthalene)-butyric acid (XV) with lithium metal in liquid ammonia. When XV was subjected to a Wolff-Kishner reduction, the product isolated was γ -(1-methoxy-5,6,7,8-tetrahydro-4-naphthalene)-butyric acid (XVI). This was proven by comparison of XVI with an authentic sample prepared from 5-methoxytetralin (XVII) according to the procedure of Bachmann and Ness.²

Compound XIV was next converted to 1-keto-7,9-dimethoxy-1,2,3,4-tetrahydrophenanthrene (XVIII) by treatment with phosphorous pentachloride and subsequent

cyclization of the acid chloride with anhydrous stannic chloride. Since the keto-function in XVIII could not be protected effectively for purposes of further synthesis, the ketone function was removed by catalytic hydrogenolysis to yield 7,9-dimethoxy-1,2,3,4-tetrahydrophenanthrene (XIX). Upon reduction of XIX with sodium in ethyl alcohol, 2-keto-10-methoxy-1,2,3,4,5,6,7,8-octahydrophenanthrene (XX) was produced.

The addition of ring A to XX was accomplished via a Robinson synthesis, giving 1-methoxy-10-keto-3,4,5,6,7,8,10,11,12,13-decahydrochrysene (XXI).

The structure of XXI was proven by conversion to 1-methoxychrysene (XXII). When the product thus obtained was mixed with an authentic sample³ prepared from 1-methoxy-3-keto-3,4,5,6-tetrahydrophenanthrene (XXIII) no depression in melting point of the mixture was observed.

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92 pages. \$1.50. Mic 56-1904

AN ATTEMPT TO ESTABLISH THE ABSOLUTE CONFIGURATION OF PICROTOXININ

(Publication No. 16,801)

Elliott Cohen, Ph.D.
Columbia University, 1956

Picrotoxadiene, cis-5-isopropyl-8-methylhydrin-4,6-diene, was synthesized by a stereospecific route. This compound is a degradation product of picrotoxinin, which is one of the two constituents of the natural product, picrotoxin.

A comparison was made of the optical rotations of picrotoxadiene from synthesis and from degradation. This, coupled with the molecular rotational difference of cis-8-methylhydrindan-5-one XVI and cis-8-methylhydrindane XVII, enabled us to postulate the absolute configuration of picrotoxinin at the ring juncture.

More substantial evidence was obtained from the rotatory dispersion curves of XVI and coprostanone. The optical rotation plotted against wave length showed that XVI belonged to the same stereochemical series as coprostanone.

By the use of an adaption of Hudson's lactone rule and by reviewing the known transformations in the degradation of picrotoxinin, it was possible to present a complete picture of the stereochemistry of all the functional groups in picrotoxinin.

The synthesis of picrotoxadiene was commenced with a Dieckman cyclization of ethyl adipate to form 2-carbethoxycyclopentanone I. This was methylated and then condensed with ethylcyanoacetate to yield ethyl-2-methyl-2-carbethoxycyclopentylidene cyanoacetate III. After hydrogenation, the material was hydrolyzed with HCl, and cis-2-methyl-2-carboxycyclopentane-1-acetic acid V resulted.

A resolution of this dibasic acid with brucine yielded

optically active material $[\alpha]_D + 37^\circ$. After diesterification and monosaponification, the half acid ester was converted into its acid chloride and condensed with ethylmalonate to yield, after hydrolysis, cis-2-methyl-2-carbethoxycyclopentane-1-acetone IX.

Sodium hydride cyclization afforded a beta diketone, cis-8-methylhydrindan-5,7-dione X. After forming the enol ether, the material was reduced with LiAlH_4 and upon decomposition of the lithium salt with HCl, cis-8-methylhydrin-6-ene-5-one XII was formed. This α, β unsaturated ketone was divided into two portions. From one part, the material was hydrogenated to yield cis-8-methylhydrindan-5-one XVI $[\alpha]_D + 15.2^\circ$. A Wolff Kischner reaction then gave cis-8-methylhydrindane XVII $[\alpha]_D + 3^\circ$.

The second portion of unsaturated ketone was reacted with isopropyl lithium to form, after dehydration, cis-5-isopropylidene-8-methylhydrin-6-ene XIII.

This material when treated with maleic anhydride and a trace of acid to form the Diels-Alder adduct of picrotoxadiene. In order to obtain a crystalline derivative the adduct was treated with aniline to form cis-5-isopropyl-8-methylhydrin-4,6-diene N-phenyl imide adduct XV M.P. 177-180° C. The absolute rotation was positive and the I.R. spectrum was almost identical with the N-phenyl imide adduct from the degradation of picrotoxinin.

The synthetic adduct was the mirror image of degraded natural material. In order to establish the absolute configuration at the ring juncture, the molecular rotational differences and the rotatory dispersion curves of picrotoxadiene's precursors were studied. When compared to similar cases in the steroid series, it was found that the synthetic material belonged to the same configurational series as the steroids. Therefore, since synthetic picrotoxadiene was the mirror image of natural material, the natural material must of necessity be the mirror image of the steroids at the C/D ring juncture.

It was hoped that iron clad evidence could be obtained by the degradation of a steroid to cis-8-methylhydrindane XVII. Then, cross correlations with synthetic material, degraded natural product and degraded steroidal material could be derived.

Degradation reactions were run on calciferol, vitamin D₂. It was possible by straightforward reactions to obtain two key intermediates, 2-(cis-8-methyl-1-hydrindanyl)-propane XXII and α -(cis-8-methyl-1-hydrindanyl)-propionaldehyde XXIV. However, the methods that removed similar side chains in the steroid series proved unsuccessful in this case.

There was good evidence to show that ozonization of XXII yielded not the expected loss of HCHC to form a methyl ketone, but, instead, XXIV was formed and also its corresponding acid α -(cis-8-methyl-1-hydrindanyl)-propionic acid XIX.

It appeared that the cis fused hydrindane system altered the usual course of reactions that proved successful in the trans fused C/D rings of the steroids.

89 pages. \$1.50. Mic 56-1905

DEUTERIUM EXCHANGE OF SOME
METHYL "ONIUM" SALTS

(Publication No. 16,917)

Arthur Kentaro Hoffmann, Ph.D.
Columbia University, 1954

Although the octet theory was proposed by G. N. Lewis in 1916, few chemical investigations have been carried out in an attempt to substantiate or disprove the theory for second and higher row fifth and sixth group elements. In order to directly compare the relative ease with which a carbanionoid center may be established α to a central element, the series of identically constituted salts – tetramethylammonium, phosphonium, arsonium, and stibonium iodides and trimethylsulfonium, selenonium, and telluronium iodides – were subjected to deuterium exchange in alkaline deuterium oxide. Each salt and two additional reference compounds, [2.2.1]bicycloheptane-1-sulfonium iodide and *n*-butyl sulfoxide, were found to undergo deuterium exchange under these conditions. Tetramethylphosphonium ion did not undergo deuterium exchange in the absence of base.

The order of hydrogen activation as shown by the extent of exchange is: trimethylsulfonium tetramethylphosphonium trimethylselenonium tetramethylarsonium trimethyltelluronium tetramethylstibonium tetramethylammonium. Rates of deuterium exchange were measured at two temperatures for the sulfonium, phosphonium and ammonium ions and the energies and entropies of activation calculated to be 32.2 Kcal and -15 e.u. for the ammonium ion, 25.6 Kcal and +4 e.u. for the phosphonium ion, 22.5 Kcal and -1 e.u. for the sulfonium ion.

Since the entropies of activation for the exchanges studied are not constant, the differences in reactivity between tetramethylammonium ion on one hand and trimethylsulfonium or tetramethylphosphonium ions on the other cannot be ascribed solely to differences in potential energy between the ground and transition states. The large negative entropy of activation of the ammonium salt suggests that in this case an increased solvation of the transition state may be partially responsible for its low reactivity. It is also possible that the mechanism of exchange for the ammonium ion does not involve an intermediate dipolar ion as postulated for the second and higher row element salts but may proceed by a termolecular displacement reaction.

In either case, the marked lability of the α hydrogen atoms in the second row salts is in agreement with the postulate that stabilization of the transition state occurs by virtue of resonance involving a dipolar ion and a neutral molecule having a defect of electrons about the central element. This structure may arise from an overlap of a carbon 2p orbital containing an unshared pair of electrons with an empty d orbital of the central element. The bond formed in this manner is a p-d Pi bond. The impossibility of such a structure in the case of the ammonium salt, since nitrogen cannot expand its octet, offers an explanation of its marked unreactivity in contrast to the second and higher row element methyl "onium" salts.

99 pages. \$1.50. Mic 56-1906

PART I. POLYMERS AND COPOLYMERS OF
p-VINYLPHENYL THIOACETATE.
PART II. DECOMPOSITION OF AZO COMPOUNDS.
CARBON-CARBON HYPERCONJUGATION
IN A FREE RADICAL REACTION.

(Publication No. 16,796)

Alexander Lebovits, Ph.D.
Polytechnic Institute of Brooklyn, 1956

Part I

The object of this research was to prepare water soluble polymers containing sulfhydryl groups. To achieve this p-vinylphenyl thioacetate was prepared in the following manner. p-Aminoacetophenone was diazotized, the diazo group reduced with sodium borohydride, and the p-thiolphenyl methyl carbinol obtained on saponification was acetylated and deacetylated to give p-vinylphenyl thioacetate. The monomer polymerized readily with free radical catalysts, and the polymers could be saponified to give poly-p-thiolstyrene which was soluble in aqueous base.

The homopolymers were precipitated from their aqueous solution by neutralization. Copolymers with methyl methacrylate were prepared using carbon tetrachloride or toluene as chain transfer agents to reduce the molecular weight. Their hydrolysis products stayed in solution at a lower pH than the homopolymers.

The hydrolyzed polymers could be oxidized with air, iodine or cystine and the oxidation reversed by cysteine or thioglycolic acid in alkaline solution. Their capability to reactivate urease which had been inactivated by oxidation was demonstrated.

High energy radiation is believed to owe its harmful effect to the capability of producing OH and O₂H radicals from water. This susceptibility can be reduced by protecting the animals exposed with cysteine injections which reduced the number of fatalities and reactivate enzymes deactivated by exposure. The capability of this polymer to reactivate urease indicates that it may provide some protection against X-rays, since the polymer is not readily excreted by the kidneys, whereas cysteine is. Additional work in this direction is in progress.

Part II

The cyclopropyl ring is known to exhibit certain features of unsaturation. Thus substitution of the cyclopropyl group in a molecule brings about changes in reactivity, absorbance and other optical properties, similar to those brought about by a vinyl group. The effect, however, is to a lesser degree.

This unsaturation phenomenon is due to delocalization of the carbon-carbon bond electrons in the strained bond (hyperconjugation). These electrons can stabilize a free radical or carbonium ion intermediate in a chemical reaction. In cases in which the cyclopropylcarbinyl carbonium ion is formed not only will the rate of the reaction be greater, but the products will be abnormal. Cyclopropylcarbinyl and cyclobutyl amines tagged with radioactive carbon gave the same products on treatment with nitrous acid. These products indicated that the methylene groups "had achieved a degree of equivalence at some point between the reactants and products."

Such results should be predicted from quantum mechanics for the carbonium ion but not for the free radical,

and it was actually observed that in the vapor phase chlorination of cyclobutane no cyclopropylcarbinyl derivatives were obtained. On the other hand the decomposition rate of 2,2'-azo-bis-2-cyclopropylpropionitrile, involving the formation of a cyclopropylcarbinyl radical, was much greater than that of 2,2'-azo-bis-isobutyronitrile. This was tentatively explained as due to contributions of resonance forms involving the delocalization of the bond electrons of the cyclopropyl ring. An alternative explanation would be to say that the cyclopropyl group being a rigid group gives rise to some "B" strain. To settle this point this research was undertaken in which 2,2'-azo-bis-2-cycloalkylpropionitriles with larger cycloalkyl groups were synthesized and decomposed. Their decomposition rates were of the same order of magnitude as 2,2'-azo-bis-isobutyronitrile. Since larger cycloalkyl groups should have a larger augmentation effect on the rate than cyclopropyl if "B" strain is important, these experiments rule out this possibility and suggest strongly that the important factor in the augmentation is hyperconjugation.

141 pages. \$1.80. Mic 56-1907

THE SYNTHESIS, PROPERTIES, AND RATES OF DECOMPOSITION OF SUBSTITUTED DIPHENYLIODONIUM HALIDES

(Publication No. 16,865)

Marvin Leon Mausner, Ph.D.
Polytechnic Institute of Brooklyn, 1956

The synthesis, physical properties and rates of decomposition of symmetrical and unsymmetrical diphenyliodonium salts have been investigated. Observed melting points (decomposition) were usually higher than those reported. While for most salts only qualitative solubilities were obtained, it was found that diphenyliodonium chloride and iodide had integral heats of solution in dimethylformamide of 4.5 and 3.3 kcal./mole.

Conductometric and cryoscopic measurements indicated essentially complete dissociation of diphenyliodonium halides in water. However, in benzene cryoscopic measurements of 4,4'-dicyclohexyldiphenyliodonium iodide gave a van't Hoff factor of 0.5, indicating aggregation to ion quadrupoles. The observations are in accord with the kinetics of decomposition of the diphenyliodonium halides: slow and of second order in water, faster and of first order in organic solvents (the rates increasing with the decreasing polarities of the solvents).

The effects of substituents on the decomposition of diphenyliodonium halides in dimethylformamide were in accord with the picture of ion pairs decomposing by nucleophilic attack of the halide ion on the 1-carbon of the cation. Three examples are tabulated:

DECOMPOSITION OF SUBSTITUTED DIPHENYLIODONIUM BROMIDES IN DIMETHYLFORMAMIDE

Substituents	Relative rate at 60°	Ea (kcal./mole)	ΔS^\ddagger (cal./deg.)
none	1.00	32	10
4,4'-(CH ₃ O) ₂	0.031	37	16
2-NO ₂	64	25	-3

For the mononitro salts the order of influence was: 2-nitro >> 4-nitro > 3-nitro.

A fair fit to the Hammett equation was found for decompositions of the diphenyliodonium halides in dimethylformamide. With the chlorides at 80° the reaction constant (ρ) was 0.8.

In dimethylformamide at 60° diphenyliodonium iodide decomposed eight times as rapidly as 2,2'-dithienyliodonium iodide.

No characteristic infrared absorption band has been found for the diphenyliodonium group other than those found for iodobenzene. Solid solutions in potassium bromide obeyed the Beer-Lambert law.

Ultraviolet spectra for a number of iodonium salts and pK_a values for 4,4'-diaminodiphenyliodonium salts were in accord with the electron-attracting nature of the iodonium group. Interaction of the iodine with the benzene ring by expansion of its valence shell probably occurs, but is less than the interaction of a nitro group with the benzene ring.

112 pages. \$1.50. Mic 56-1908

BORATE ESTER COMPLEXES OF GLYCOPYRANOSIDES

(Publication No. 16,792)

J. Claine Petersen, Ph.D.
University of Utah, 1956

Chairman: James M. Sugihara

The reaction of boric acid with polyols in an aqueous medium has received considerable attention; however, studies involving the use of an anhydrous system are limited and the characterization of products incomplete.

In this study, borate ester complexes of several methyl glycosides were prepared in anhydrous acetone using boron oxide or metaboric acid-III. The blocking exhibited by these borate esters was studied by subsequent benzylation followed by cleavage of the borate linkages. Separation of the mixed benzoate esters was accomplished by chromatography on Magnesol. In order to effect more complete recovery of the minor products, the benzyolated β -glucosides were acetylated prior to chromatographic separation. The major products isolated in the β -glucoside series were the 4,6-diacetate 2,3-dibenzoate, the 3,4-diacetate 2,6-dibenzoate and the 4-acetate 2,3,6-tribenzoate, representing 4,6-, 3,4- and 4-blocking, respectively. The minor products were the tetraacetate, the 2,3,4-triacetate 6-benzoate and the tetrabenzoate, indicating complete blocking, 2,3,4-blocking, and total cleavage of the borate linkages. The total recovery of these products accounted for approximately two-thirds of the methyl β -D-glucopyranoside applied.

Methyl α -D-glucopyranoside upon benzylation yielded the 2,6-di-O-benzoyl derivative, again representing 3,4-blocking as in the β -glucoside series.

Benzylation of the borate ester complex of methyl β -D-galactopyranoside yielded the 2,3-dibenzoate, arising from 4,6-blocking, as the major product isolated. An unknown dibenzoate, not completely characterized, was also found.

New derivatives of methyl β -D-galactopyranoside prepared during this study were methyl 2,6-di-O-benzoyl-3,

4-O-isopropylidene-, methyl 2,6-di-O-benzoyl-, and methyl 4,6-di-O-acetyl-2,3-di-O-benzoyl- β -D-galactopyranoside. A new crystalline form of methyl 2,3,4,6-tetra-O-benzoyl- β -D-glucopyranoside was also prepared.

In complexing with boric acid, certain hydroxyl groups of the glycosides appear to be preferred, the resulting linkages being moderately stable toward benzoylation, as indicated by the major products obtained. Reaction with any hydroxyl group, however, seems possible, but the more labile linkages are subsequently cleaved during benzoylation. Severe benzoylation conditions cause widespread cleavage of the borate ester linkage.

72 pages. \$1.50. Mic 56-1909

A POLAROGRAPHIC STUDY OF THE STATIONARY MERCURY ELECTRODE

(Publication No. 16,882)

Paul Vastine Peurifoy, Ph.D.
Kansas State College, 1956

This research was carried out to study the usefulness, sensitivity, reproducibility, and characteristics of a stationary mercury electrode of small diameter which is used in conjunction with a glass tube stirrer.

The glass tube stirrer, which extended 5 mm. over the electrode tube, was rotated at 600 r.p.m. The tip of the electrode was coated with ceresin wax. The electrode was conditioned by making one or more pre-runs and by lowering the mercury a few millimeters for several minutes before making the run.

A modified cell design is presented which simplifies the waxing of the electrode. A small water bath and a support stand especially designed for this cell are described.

The following substances were investigated: benzil, 1, 3-dinitrobenzene, maleic acid, oxalic acid, bromide ion, thiosulfate ion, uranyl ion, and ions of cadmium, cobalt, copper, lead, antimony, stannous tin, and thallium. Satisfactory waves were obtained with all the substances examined except cobalt, bromide ion, and oxalic acid. In the majority of the cases studied, maxima were not observed; however, cobalt, antimony, bromide ion, and the second thiosulfate wave produced peaks which were difficult to suppress.

Half-wave potentials and diffusion currents were reported for the substances studied over the usable concentration ranges. The lower limit of concentration is about 0.5×10^{-6} M. A precision of about 0.4 per cent was observed in some cases. The half-wave potentials determined with this electrode were generally more negative than the corresponding potentials obtained with the dropping mercury electrode. The diffusion currents obtained with the stationary mercury electrode are two to four times greater than those obtained with the dropping mercury electrode.

102 pages. \$1.50. Mic 56-1910

CHEMISTRY, PHYSICAL

A SEARCH FOR NEW POLYSOAPS: SYNTHESSES OF PROMISING MACROMOLECULES AND THEIR CHARACTERIZATION BY VISCOSITY AND SOLUBILIZATION

(Publication No. 16,670)

Clayton John Ammondson, Ph.D.
Rutgers University, 1956

This investigation is concerned with the preparation of some new polyelectrolytes and the testing of these new substances for polysoap character. A polysoap is a pre-fabricated micelle containing a fixed number of soap units which are held near each other by primary valence bonds. Previously, polysoaps, prepared by the partial quaternization of poly-2- or poly-4-vinylpyridine with dodecyl bromide (1), were found to be more efficient solubilizers than the corresponding association colloid (2). Consequently, new cationic and anionic polyelectrolytes containing long hydrocarbon tails were prepared in the hope that even better solubilizers could be found. Viscosity techniques were used to determine the degree of compactness of the new molecules. Those which had low reduced viscosities were tested for solubilization efficiency with a wide range of compounds serving as solubilizates.

The cationic polysoaps were prepared from poly-2-vinylpyridine (estimated molecular weight, $1.2-1.4 \times 10^6$) by quaternizing about 30-40% of the nitrogens with dodecyl bromide, tetradecyl bromide, hexadecyl bromide, 3-phenylpropylbromide, 3-bromophenylpropyl ether and 11-bromoundecanoic acid. No water-soluble products were obtained with α -bromo-p-phenylacetophenone. The alkyl polysoaps had low reduced viscosities, and in 2% aqueous solutions they solubilized the following approximate amounts of substances (in milligrams per gram of polysoap): decane 50, diphenylmethane 200, naphthalene 75, anthracene 2.5, 7,12-dimethylbenz[α]anthracene 2.5, N,N-dimethylaminoazobenzene 15, cholesterol 4, testosterone propionate 30.

The phenylpropyl and phenylpropyl ether quaternaries were found to be less compact than the aliphatic polysoaps, but the phenylpropyl product, at least, had lower reduced viscosity values than those anticipated for an ordinary polyelectrolyte. The phenylpropyl "polysoap" did not solubilize any of the solubilizates. However, its aqueous solution easily formed emulsions with diphenylmethane, N, N-dimethylaminoazobenzene and 7,12-di-methylbenz[α]anthracene. The 11-undecanoic acid-poly-2-vinylpyridinium bromide was an interesting polyampholyte with about a fourth the solubilization efficiency of the aliphatic polysoaps.

During attempts to prepare anionic polysoaps, copolymers of dodecyl methacrylate and methacrylic acid were found to be water-insoluble and to hydrolyze when heated at 50-60° in dilute base. Similarly it was found that of a series of copolymers of p-dodecylstyrene and methacrylic acid, only the one containing 5.9 mole % p-dodecylstyrene was soluble in aqueous base. Viscosity studies of the potassium salt of this copolymer show typical polyelectrolyte behavior at low concentrations and considerable aggregation at higher concentrations.

Because of difficulties encountered in the preparation of pure methyl-p-vinylbenzenesulfonate only two

copolymers were prepared from p-dodecylstyrene and methyl-p-vinylbenzenesulfonate. Neither contained sufficient p-dodecylstyrene to give it polysoap properties after hydrolysis. The potassium salt of one copolymer behaved as a typical polyelectrolyte in water at concentrations below 1.3%, but formed solutions too viscous to measure in capillary viscometers at higher concentrations. Thus, both the carboxylic and sulfonic acid polyelectrolytes which contain small amounts of hydrophobic chains behave similarly to the poly-4-vinylpyridine polysoap which contained 6.7% dodecyl bromide reported by Strauss and Gershfeld (1). At higher concentrations all of these materials are aggregated by strong intermolecular forces.

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STUDIES OF THE OPTICAL SENSITIZATION AND THE MECHANISM OF THE PHOTOTHERMAL DECOMPOSITION OF MERCUROUS OXALATE

(Publication No. 16,674)

Robert Howard Brill, Ph.D.
Rutgers University, 1955

Certain compounds are unique in that their rates of thermal decomposition can be greatly accelerated if the compounds are first irradiated with light of an appropriate wavelength. Such compounds may be utilized in a photographic process and are said to be photothermographic.

A photothermographic system can be prepared by suspending a suitable solid material, such as mercurous oxalate, in gelatin and coating the resulting emulsion onto a glass base. If an image is projected onto this sort of a system, the regions irradiated by light are susceptible to a more rapid thermal decomposition than the unirradiated regions. Thus if heat development follows the exposure, those areas which have been irradiated undergo a more rapid decomposition and produce a negative image composed of mercury.

Moderate success has been achieved with the use of mercurous oxalate emulsions, but they are considerably less sensitive than conventional silver-halide emulsions. This is due partly to the fact that the inherent sensitivity of mercurous oxalate lies in the ultraviolet region of the spectrum, and there is little, if any, sensitivity to visible light.

The objects of this investigation were (a) to sensitize mercurous oxalate emulsions to visible light, (b) to determine the mechanism of the photothermal decomposition, and (c) to determine the efficiencies of the image-forming and heat-development steps.

(a) The sensitivity of mercurous oxalate emulsions was extended into the visible region by the addition of sensitizing dyes. The sensitizing powers of twenty-four dyes were evaluated by determining the overall quantum yields of the photothermographic process in dyed emulsions.

Acridine-type dyes were found to be the most effective, but certain phthaleins and cyanines were nearly as good.

The spectral ranges sensitized coincide with the energy-absorption spectra of the emulsions and are very nearly the same as the ranges sensitized by the corresponding dyes in silver-halide systems.

Adsorption of the dyes by mercurous oxalate is an important factor, and seems to form the basis of differentiation between several structurally related dyes.

(b) A structure is proposed for mercurous oxalate in which mercurous and oxalate groups are linked together by covalent bonds to produce long chain-like molecules. On the basis of this structure, a free-radical chain reaction is postulated to explain the photothermal decomposition. The proposed structure is quite similar to the structure of compounds whose decompositions are known to proceed by free-radical mechanisms. The mechanism is also shown to be energetically reasonable.

The lack of photoconductivity in mercurous oxalate, the effect of certain inhibitors, and the photothermographic behavior of related salts are experimentally consistent with the proposed mechanism.

(c) Photolysis experiments show that the formation of a print-out image is slightly temperature dependent. An activation energy of 1.41 kcal./mole was determined. For exposures at room temperature, the quantum yield of the print-out process is dependent upon the wavelength of the radiation used. Values of the quantum yield range from 0.26 to 0.85 atoms of mercury per quantum of ultraviolet radiation absorbed.

A kinetic chain-length for the heat development step, calculated in accordance with the postulated mechanism, indicates that approximately 1700 atoms of mercury can be produced from each developable nucleus formed by exposure to light. There is some reason to believe that a nucleus can be developed only along a mercurous oxalate chain within a crystal, and that development is limited by the length of the crystal. 191 pages. \$2.50. Mic 56-1912

THE EFFECT OF SHEAR RATE ON SOLUTION VISCOSITY METHODS FOR CHARACTERIZING HIGH POLYMERS

(Publication No. 16,887)

Kenneth Haldane Cram, Ph.D.
Princeton University, 1955

The purpose of this work was to investigate the effect of non-Newtonian behavior of solutions of cotton cellulose upon various methods used to determine intrinsic viscosities. Of central interest was the relative ability of these methods to distinguish between samples only slightly different, in particular between cottons subjected to various degrees of mechanical degradation during textile processing.

A Couette-type rotational viscometer was specially designed and constructed for obtaining absolute flow curves at very low shear stresses. Of particular design interest was the use of a transit scale to measure deflection of the torsion wire. This viscometer was operated successfully over a shear-rate range of 0.02 to 50 sec.⁻¹ and a shear-stress range of 0.01 to 100 dynes/sq.cm. In a series of

runs to determine precision the standard deviation of measurements was 0.7%. Determination of absolute viscosities of standard oils and water showed a positive absolute error of 2.1%, independent of shear rate, and probably due to end effects.

An approximate method was developed for calculating absolute flow curves of non-Newtonian liquids from data obtained with capillary or rotational viscometers. By use of an intermediate radius rather than a wall radius it is possible to calculate shear rates and stresses in a fashion similar to that employed with Newtonian liquids. The method is particularly useful in the case of the rotational viscometer since it yields results of high accuracy and is much simpler to apply than previously available methods. Graphs are presented to facilitate choice of the proper intermediate radius.

Using the rotational viscometer for the low stress range and Cannon-Fenske capillary viscometers for the high stress range, absolute flow curves of 0.1, 0.2, and 0.3 g./dl. solutions of two cellulose samples in 0.5 M. cupriethylenediamine were determined over a shear-stress range of 0.01 to 1500 dynes/sq.cm. and shear-rate range of 0.02 to 40,000 sec⁻¹. The two cellulose samples were bale cotton and the same cotton after it had been passed through a carding beater eight times. The flow curves of both samples at the three concentrations were Newtonian below a shear stress of approximately 1.0 dynes/sq.cm. and non-Newtonian above that stress.

The viscometric data obtained during determination of the flow curves were used to calculate intrinsic viscosities by several methods. The most satisfactory method was based on viscosities calculated from the Newtonian portions of the flow curves. Results based on measurements in the non-Newtonian range were shown to be dependent upon the method of measurement. Neither the A.S.T.M. method ("A.S.T.M. Standards on Textile Materials," Philadelphia, 1952, D539-51T, pp. 288-306) or the Counterpart Method (Krieble, J. G., and Whitwell, J. C., *Textile Research Journal* 19, 253, 556 [1949]) satisfactorily eliminated effects of shear rate. The method of Hall and Fuoss (Hall, H. T., and Fuoss, R. M., *J. Am. Chem. Soc.* 73, 265 [1951]) proved totally unsatisfactory since the deviation from Newtonian flow was very much greater than that for which the method was developed.

Intrinsic viscosities based on the low shear-stress Newtonian viscosities obtained with the rotational viscometer and on apparent Newtonian viscosities at zero applied head with the capillary viscometers yielded the best differentiation between the two cottons from a statistical standpoint. When the primary objective is to differentiate between samples, the best method appears to be comparison of apparent Newtonian viscosities at a single relatively high concentration and a single shear stress. These two conditions can readily be satisfied by use of a single Cannon-Fenske capillary viscometer at zero applied head. The high concentration is preferred because, in the case studied, the percentage difference between samples increased with concentration.

203 pages. \$2.65. Mic 56-1913

KINETICS AND CATALYSIS OF THE ISOTOPIC EXCHANGE REACTION OF CARBON BETWEEN CARBON MONOXIDE AND CARBON DIOXIDE

(Publication No. 16,916)

Fred Gollob, Ph.D.
Columbia University, 1954

The activity of a number of catalysts toward the exchange reaction:



has been determined. When compared on the basis of activity per square meter of surface, the catalysts, in order of decreasing activity, are activated iron, copper chromite, hopcalite, copper, nickel, cobalt, vanadia-alumina, chrome-alumina, alumina and tungsten-alumina. The energy of activation of the reaction over each of these catalysts was also measured, except for copper.

The kinetics of the exchange reaction over activated iron and vanadia-alumina catalysts were studied in more detail. For the activated iron catalyst, the following expression describes the dependence of the rate of reaction r_c on the partial pressures of carbon monoxide and carbon dioxide in the total pressure range of from 1.0 to 20.0 cm.

$$r_c = 20.3 \times 10^{-8} P_{\text{CO}}^{0.5} P_{\text{CO}_2}^{0.0}$$

In these experiments the mole fraction of carbon monoxide was varied from 0.25 to 0.75. This expression indicates that the surface is saturated with carbon dioxide and that the amount of adsorbed carbon monoxide is proportional to the square root of the carbon monoxide partial pressure. For the vanadia-alumina catalyst, the rate dependence is described by the following expression:

$$r_c = 12.7 \times 10^{-8} P_{\text{CO}}^{1.0} P_{\text{CO}_2}^{0.0}$$

This expression was found to hold in the total pressure range of from 0.5 to 20.0 cm. pressure. The mole fraction of carbon monoxide was varied from 0.25 to 0.75. From the expression for the reaction rate it is indicated that the surface is saturated with respect to carbon dioxide. Exchange then occurs when carbon monoxide molecules contact these adsorbed carbon dioxide molecules, either by adsorption of carbon monoxide molecules on sites adjacent to be carbon dioxide, or by carbon monoxide molecules of the gas phase striking adsorbed carbon dioxide molecules. The rate expressions given for the activated iron and vanadia-alumina catalysts do not hold when the partial pressure of carbon dioxide is in the region of six mm. or less. This effect has been studied in more detail over the vanadia-alumina catalyst, and the results indicate that the surface is no longer saturated with carbon dioxide at these low pressures of carbon dioxide. The deviation of the rates of reaction of runs in which the partial pressure of carbon dioxide was low can be accounted for by this explanation. Experiments involving the simultaneous exchange of C¹³ and O¹⁸ on a reduced copper oxide surface have shown that the two exchange rates are the same and have the same activation energy, within the limits of the experimental error. This indicates that the carbon exchange is probably a simple oxygen transfer from the carbon dioxide molecules to the carbon monoxide molecules.

186 pages. \$2.45. Mic 56-1914

THE DISSOLUTION OF CADMIUM IN CHROMIC CHLORIDE-HYDROCHLORIC ACID SOLUTIONS

(Publication No. 16,769)

Edward Hillner, Ph.D.
New York University, 1956

Adviser: C. V. King

The rate of the reaction between cadmium cylinders and acidified chromic chloride solutions is given as a function of chromic chloride concentration, hydrochloric acid concentration, peripheral speed, and temperature; using both chromic chloride complexes. The favored reaction is the one which quantitatively produces chromous ion; the mechanism, however, is dependent upon which form of the two complexes is used.

In violet chromic chloride solutions containing the hex-aquochromic ion, the reaction is chemically-controlled and first order with respect to the chromic ion. The rate as a function of the mean activity of the hydrochloric acid is also presented. In green solutions containing the dichloro-tetraquochromic ion, the overall reaction is first order and transport-controlled. Rate equations for the dissolution in acidified violet and green solutions, as well as in hydrochloric acid alone are also presented.

Potential measurements indicate that the dissolving cylinder acts as a cadmium-cadmium ion electrode, the potential of which can be given as a function of the mean activity of the hydrochloric acid.

71 pages. \$1.00. Mic 56-1915

RATE MEASUREMENTS ON FAST REACTIONS IN A STIRRED FLOW REACTOR: THE ALKALINE HYDROLYSIS OF METHYL AND ETHYL FORMATE

(Publication No. 16,832)

Harrie Moreland Humphreys, Ph.D.
Columbia University, 1954

The continuous flow stirred tank reactor technique has been used to measure the reaction rate constants for the alkaline hydrolysis of ethyl formate in 85% ethanol and of methyl formate in water, thus demonstrating the applicability of this method to the study of fast reactions.

The rate constants were determined at 10°, 20°, and 30° C., and energies and entropies of activation were calculated. Comparison of these data with existing data on the alkaline hydrolysis of other ethyl esters in 85% ethanol and other methyl esters in water shows that differences in the rates of saponification of esters of straight chain aliphatic acids are due primarily to differences in the entropies of activation, activation energies remaining constant within experimental error.

An explanation for the observed entropy changes is given in terms of the nucleophilic character of alkyl groups and their effect on the solvation entropies of the ions involved.

An outline of the experimental techniques is given, and the apparatus used (including a device for maintaining a very slow, constant flow of liquid) is described.

35 pages. \$1.50. Mic 56-1916

KINETICS OF THE POLYMERIZATION OF ALLYL ACETATE WITH BENZOYL PEROXIDE

(Publication No. 16,790)

Morton Litt, Ph.D.
Polytechnic Institute of Brooklyn, 1956

This work attempts to describe quantitatively the polymerization of allyl acetate with benzoyl peroxide in the temperature range of 65-90°C. A kinetic scheme is postulated which includes the following reactions: 1) unimolecular decomposition of peroxide and reaction of benzoyloxy radical with monomer; 2) propagation of active monomer radical by addition to further monomer; 3) early chain transfer by growing radical on monomer in the allylic position to produce a resonance stabilized radical and also some chain transfer on the acetyl group of the allyl acetate; 4) the initiation of new physical chains by the addition of the radicals mentioned in 3) to monomer; 5) induced decomposition of peroxide by attack of benzoyloxy, growing, and resonance stabilized radicals; chain transfer by benzoyloxy radicals on peroxide is important at 90°C. but negligible at 65°C.; and 6) cross and homotermination reactions between growing radicals and resonance stabilized radicals.

A kinetic scheme based upon the above steps was solvable and equations describing rate of peroxide disappearance, $-\frac{d \ln P}{dt}$, rate of disappearance of monomer with respect to peroxide, $\frac{dM}{dP}$, and degree of polymerization, \overline{DP} , were derived. Polymerizations were performed at 65, 80 and 90°C. and $-\frac{d \ln P}{dt}$, $\frac{dM}{dP}$, and \overline{DP} were measured. By an iterative procedure, using the experimental data, it was possible to find numerical values for the parameters in the equations. If the values of peroxide and monomer when the peroxide was half decomposed were substituted into the

TABLE XXII

COMPARISON OF CALCULATED WITH EXPERIMENTAL RESULTS AT THE HALF-DECOMPOSITION POINT

Temp. °C.	P_O (wt.%)	$-\frac{d \ln P}{dt}$		$\frac{dM}{dP}$		\overline{DP}	
		Exp.	Calc.	Exp.	Calc.	Exp.	Calc.
65.2	0.52	0.0199	0.0200	60.6	61.3	25.4	25.3
65.2	2.00	0.0253	0.0254	40.7	39.6	23.3	23.2
65.2	5.06	0.0316	0.0319	27.3	27.4	20.0	19.7
80.1	0.26	0.166	0.155	48	48	22.6	22.4
80.1	0.50	0.170	0.168	40.3	40.3	21.0	21.3
80.1	0.97	0.178	0.183	34.0	34.4	19.8	20.1
80.1	1.99	0.200	0.200	28.7	28.8	18.1	20.1
80.1	4.94	0.221	0.226	20.5	21.4		
80.1	6.00	0.227	0.230	18.5	19.7		
80.1	9.97	0.235	0.237	15.6	14.9		
90.1	0.52	0.526	0.530	35.1	36.2	19.5	19.8
90.1	1.98	0.702	0.690	24.4	23.6	17.3	17.1
90.1	4.84	0.967	0.974	18.1	13.7	14.5	14.6

equations, the values calculated for $-\frac{d \ln P}{dt}$, $\frac{dM}{dP}$, and \overline{DP} agreed with the experimental data over the temperature range which was investigated, Table XXII from text. If initial values of peroxide and monomer concentration were substituted into $-\frac{d \ln P}{dt}$ and $\frac{dM}{dP}$, and the equations numerically integrated, the calculated curves coincided with experimental curves.

It was concluded that the scheme as presented is substantially correct. Any error lies in the assumptions made about the induced decomposition of peroxide.

This kinetic scheme, or a slightly modified version, can probably be used to describe the polymerization of any allyl compound. 125 pages. \$1.60. Mic 56-1917

THE SLOW EXCHANGE REACTION BETWEEN IODOBENZENE AND AQUEOUS POTASSIUM IODIDE

(Publication No. 14,414)

Peter Joseph Manno, Ph.D.
Purdue University, 1955

Major Professor: W. H. Johnston

In recent years there have been many important applications of radiochemistry in the field of reaction kinetics. The present thesis will describe the extension of these techniques to the study of extremely slow reactions by the use of low level counting, especially of gamma emitters. In particular a scintillation spectrometer was built for low level operation and applied to the study of the slow isotopic exchange reaction between iodobenzene and aqueous potassium iodide at ordinary temperatures.

A low level scintillation spectrometer has a number of interesting features, that makes it very useful for investigations using gamma emitters. It has a sodium iodide thallium activated crystal to maximize the absorption of extraneous radiation. Furthermore, additional background elimination is possible by pulse height analysis, thus yielding a better signal to noise ratio. Finally, by the use of extremely stable electronic circuits, it is possible to obtain accurate counting over long periods of time.

Organic chemists have found nucleophilic aromatic substitutions of monohalogenated benzenes to proceed slowly and in some cases apparently not at all. The experimental procedure to follow the kinetics of the slow isotopic exchange reaction between iodobenzene and aqueous potassium iodide, entails mixing high specific activity aqueous potassium iodide with iodobenzene; separating the organic phase, and washing repeatedly to a constant specific activity of iodobenzene. From the variation of the specific activity of iodobenzene with the reaction time, a first order isotopic exchange constant was determined. Using kinetic derivations, the rate of reaction, apparent activation energy and apparent activation entropy were obtained.

The reaction mechanism was found to be a competition between heterogeneous and homogeneous mechanisms of exchange. At low concentrations of aqueous potassium iodide the reaction follows Langmuir-Hinshelwood kinetics. At high concentrations of aqueous potassium iodide

the homogeneous mechanism predominates with a first order dependence on the potassium iodide concentration. Studies of the catalytic effects of other surfaces support the dual mechanism interpretation. The half time of the exchange was observed to vary from 9 to 140 years over a range of 2×10^{-3} to 10^{-2} Formal aqueous potassium iodide. From the rate of reaction at 16, to 46°C, apparent activation energies of 3.7 kcal. mole⁻¹ and 10.7 kcal. mole⁻¹ were obtained for the homogeneous and heterogeneous regions, respectively.

In the homogeneous region the reaction can be taking place in either the iodobenzene or the aqueous phases. Apparent activation entropies of -88.0 e.u. and -83.3 e.u. were calculated for the iodobenzene and aqueous phases, respectively. In a two phase system some caution must be employed in interpreting the apparent activation entropy or energy. They may be the sum of the true value and an effect due to the solution of the solute in the reaction phase.

We can consider five mechanisms for the reaction in the homogeneous region, diffusion control, free radical, ionic, stable intermediate, and an aromatic S_N2. Four of the mechanisms can be discounted since they would predict the formation of aromatic by-products, none of which were detected experimentally. An aromatic S_N2 mechanism would be the most reasonable in terms of our experimental data. A negative enthalpy or entropy of solution would result in the true values for the activation energy or entropy being comparable to other aromatic S_N2 reactions. In addition the S_N2 mechanism would not predict the formation of aromatic by-products.

142 pages. \$1.90. Mic 56-1918

THE VIBRATIONAL SPECTRA AND STRUCTURE OF FERROCENE AND RUTHENOCENE

(Publication No. 16,881)

Richard David Nelson, Ph.D.
Kansas State College, 1956

The purpose of this dissertation was to obtain further evidence as to the structure of bis-cyclopentadienyl metal compounds by means of a vibrational analysis of ferrocene, Fe(C₅H₅)₂ and ruthenocene, Ru(C₅H₅)₂. In order to better interpret the difference among carbon-hydrogen, carbon-carbon and ring-metal modes of vibration ferrocene-d-10, Fe(C₅D₅)₂ was also studied.

Due to the existence of an optimum concentration effect in ferrocene, special technique was employed to obtain the Raman spectrum. Interference by solvent Raman bands prevented observation in the region of 800 cm⁻¹.

The model proposed for these compounds has D_{5d} symmetry. Selection rules for a D_{5d} model predict the appearance of fifteen Raman and ten infrared fundamental frequencies. These numbers are in reasonable agreement with those observed in the vibrational spectra.

The vibrational spectra of ferrocene and ruthenocene contained some unusual and interesting features. Although the molecules have a center of symmetry and the rule of mutual exclusion should hold, coincidences between the Raman and infrared spectra were observed. Coincidences appear because there is little interaction between symmetric ring modes and antisymmetric ring modes.

Another unusual feature is the appearance of band systems near 1700 cm^{-1} in the infrared spectra of both compounds. As no structural feature of these compounds would cause fundamental frequencies in this region, the bands systems were interpreted as overtone and combination bands involving CH modes of vibration.

Frequencies due to motion within the rings were found to occur at essentially the same positions in ferrocene and ruthenocene. Frequencies due to ring-metal vibrations were found to occur at different positions. Carbon-carbon and carbon-hydrogen frequencies were found to be consistent with the D_{5d} model containing planar aromatic rings.

The assignment of frequencies to the fundamental modes of vibration for a D_{5d} model was carried out for ferrocene, nickelocene and ruthenocene. This assignment was facilitated by comparison of the cyclopentadienyl ring modes to similar modes in benzene and comparison of ring-metal modes to the modes of linear XY_2 molecules. Inactive modes of vibration were assigned on the basis of coincidences between symmetric and antisymmetric ring vibrations. The assignment for nickelocene is somewhat more empirical than that for ferrocene or ruthenocene in that no Raman spectrum was obtained with the result that more emphasis was placed on positions of infrared frequencies and assignments for similar modes in ferrocene and ruthenocene. Frequencies not assigned to fundamental modes were assigned as combination bands.

A normal coordinate analysis was performed on a ferrocene ring, $(C_5H_5)^+$. The valence force symmetry constants calculated for $(C_5H_5)^+$ were in reasonable agreement with those calculated for benzene and tropylium ion confirming the aromatic nature of the ferrocene rings.

The thermodynamic functions for ferrocene, nickelocene and ruthenocene were calculated using the vapor phase, rigid rotator, harmonic oscillator approximation. The functions C_p^0 and S^0 calculated for these compounds are all considerably lower than most metalorganic compounds of comparable molecular weight, which is expected in view of

the stability and high symmetry of these compounds. The thermodynamic functions of formation for ferrocene and nickelocene were also calculated.

88 pages. \$1.50. Mic 56-1919

COLLISIONAL ENERGY TRANSFER IN THE THERMAL DECOMPOSITION OF NITRYL CHLORIDE

(Publication No. 16,863)

Milton Lewis Volpe, Ph.D.
Stanford University, 1956

The efficiency of molecular energy exchange was studied by determining the effect of fifteen added, nonreactive gases upon the rate of thermal decomposition of nitryl chloride; previously, Cordes had shown that reaction to be unimolecular.

The investigation was carried out in the low pressure (3-5 mm.) region, at a temperature of 476°K ., by colorimetrically measuring the rate of appearance of nitrogen dioxide, one of the decomposition products. Apparatus was designed to assure rapid and complete mixing of added gas and reactant, and to provide adequate temperature control.

From the rate measurements, the efficiency in activating reactant molecules, relative to that of nitryl chloride itself, was calculated. These relative efficiencies were compared with results of other similar investigations, and they were correlated with some molecular interaction parameters. Such comparisons showed that:

1. Deactivation does not occur with each collision.
2. The relative efficiencies of activation, per collision, is relatively independent of the internal degrees of freedom of the added gas, but are strongly dependent upon the magnitude of the intermolecular forces.

104 pages. \$1.50. Mic 56-1920

ECONOMICS

ECONOMICS, GENERAL

INVENTORY VALUATION METHODS AND ECONOMIC DECISIONS

(Publication No. 16,841)

Alan Robert Cerf, Ph.D.
Stanford University, 1956

Accounting procedures for inventories have many implications for economic decision making. This inquiry examines the influence of the most commonly used inventory accounting procedures on selected economic decisions. One of my major considerations is the validity of the claim found in the literature that certain inventory methods which include "inventory profits and losses" in reported profits tend to accentuate the expansions and contractions of business cycles. I also attempt to appraise the connection between the use of certain inventory methods and the aggravation of inflationary pressures.

The specific economic decision making areas examined here are those concerned with declaration of dividends, purchase of inventory, demand for credit, supply of credit, and evaluation of securities. The inventory valuation methods examined are: first-in, first-out; last-in, first-out; cost or market, whichever is lower; average cost; and market.

An objective in itself, as well as an integral part of this study is the determination of how the results of alternative inventory valuation methods differ under dissimilar combinations of variables. The specific results examined are reported profits, tax liabilities, cost of goods sold, ending inventory valuations, cash positions, and financial statement ratios.

A number of business cycle and inflationary price patterns are developed and combined with different turnover rates and markup rates. The rates of price change, turnover rates, and markup rates used are those which appear to be representative after an extensive examination of rates which have prevailed in different industries and trades in the past. The majority of the price patterns are based on National Bureau of Economic Research analysis of historical price data.

In order to determine whether different decisions can be expected due to the use of alternative inventory valuation methods, profit figures and other data ensuing from the inventory methods are incorporated with other factors important in the individual economic decision.

My integration of the results of the entire analysis indicates that the claim that the use of certain inventory valuation methods significantly affects the booms and depressions of business cycles is largely exaggerated. However, during the more unusual periods of rapid inflation or during business cycles when there is a combination of a significant degree of price change with a low markup and a slow turnover, inventory profits (or losses) can become generally quite significant. Also during ordinary business

cycles for the minority of firms or industries which experience rapid rates of price change together with slow turnover or small markup important effects on decision making can result.

Examination of the dividend-retained earnings decision indicates that in the majority of cases differences in dividend payments are not sizable enough to have far-reaching effects on cyclical fluctuations. I find no tendency for a dissipation of resources through excessive distribution of earnings.

My analysis indicates that the relatively greater stability of last-in, first-out profits and last-in, first-out dividends probably would act to a small degree to lessen business cycle fluctuations. In addition the relatively larger profit figures and dividend payments under the first-in, first-out method may well be an aggravating influence during inflationary periods.

I conclude only minor differences in the amount and timing of inventory purchases are likely to ensue from the use of alternative inventory valuation methods. In the majority of cases, in all probability, neither the supply nor the demand for credit will be extensively affected by the choice of inventory valuation method. There seems to be no reason to believe that the evaluation of securities will be materially affected either.

The real significance to the firm of the various methods depends on the actual combination of rates of price change, turnover rates, and markup rates which the firm experiences. Examination of a large number of realistic combinations of variables indicates that in many cases the differences in the profit figures produced by alternative methods are not large, but in some cases they are. In those situations in which profit figures are significantly different variances in tax liabilities produced by alternative methods are important to the firm.

205 pages. \$2.70. Mic 56-1921

PALESTINE'S BALANCE OF PAYMENTS, 1932-1946

(Publication No. 13,698)

Asher Halperin, Ph.D.
Princeton University, 1954

"Palestine's Balance of Payments, 1932-1946" is a case study of the adjustment of the Palestinian balance of payments to a disturbing factor in the form of heavy capital imports.

In the years 1932-1935 there was a sharp increase in Palestine's capital imports, accompanied by economic prosperity. In 1936-1939, the influx of capital fell drastically and this had repercussions on Palestine economy. The prosperity of the early thirties was followed by a recession in the late thirties. Two other factors were important in Palestine economy in the 1930's: immigration

and political disturbances. The early thirties were marked by large-scale immigration into Palestine. The immigrants, predominantly Jews of European origin, brought with them capital, skill, entrepreneurship, Western methods of production, as well as Western habits of consumption. The immigration into Palestine declined sharply in the late thirties. Political disturbances in 1936-1939 had some effect on the Palestine economy. Yet it appears that capital movements, more than any other factor, were responsible for the fluctuations in Palestine's income in the 1930's.

During the Second World War, the importance of capital inflow declined. A new factor - British military expenditure - replaced capital imports as the main source of Palestine foreign exchange earnings. The receipts from the sale of goods and services to the military forces in the area, and in part, the continued capital inflow by Jewish national institutions, could not be utilized abroad to purchase goods and services badly needed by Palestine because of the War restrictions. The large funds Palestine earned during the War were transferred to Great Britain to form what was later known as "Sterling Balances." The adjustment of the Palestinian balance, in the form of large commodity imports, to the inflow of funds was thus deferred to the post-war period, in fact to the period following the establishment of the State of Israel.

This study, which attempts to test the various mechanisms of adjustment of the balance of payments in the light of the Palestinian experience in the years 1932-1946, opens with a historical and political introduction. Following a description and analysis of the monetary and banking system, it goes on to explain the structure and composition of the Palestine balance of payments, with special emphasis on capital movements. One chapter is devoted to a survey of the major mechanisms of adjustment of the balance of payments, while the next chapter uses the various mechanisms to test their applicability to the Palestinian experience. It is established that this experience was, by and large, a sequence of events to be expected in the light of the accepted explanations of sectional price changes and changes in income theories.

In addition, it was found that the monetary system, a Sterling exchange standard of the Currency Board type, and the banking system facilitated the adjustment of the Palestinian balance. It was also realized that there was a direct, and on the whole a causal, relationship between the Palestinian balance of payments and the volume of currency in circulation in Palestine (notes issued by the Palestine Currency Board).

Other factors assisting the Palestinian adjustment were: i) immigration that accompanied capital transfers and supplied the labor needed for the economic expansion of the country; ii) the absence of an independent monetary policy that might have interfered with the process of adjustment; and iii) the fact that the capital was largely imported in the form of goods, so that the disturbing factor came together with the equilibrating factor.

The final Chapter includes a comparison of the adjustment of the Palestinian balance and that of the American balance in the 1930's, an explanation of the reasons for the relatively "smooth" transfer of the capital into Palestine, and a note on the difference between the Palestinian and the Israeli balance of payments.

439 pages. \$5.50. Mic 56-1922

AN ECONOMETRIC INVESTIGATION OF THE SIZE DISTRIBUTION OF LIFETIME AVERAGE ANNUAL INCOME

(Publication No. 16,861)

Robert Summers, Ph.D.
Stanford University, 1956

Nearly all of the estimates of the size distribution of income that are now available relate to a one-year accounting period. Here an attempt has been made to extend the accounting period to cover the forty-odd years which make up the main period of income-seeking activity of the typical household. Since income histories of households are not available, the size distribution of income for the "lifetimes" of urban households was estimated from data which related to income-changes in urban households observed in field-surveys in two different pairs of post-World War II years. Income-dynamics relationships—relationships between household incomes in successive years—were obtained for households headed by persons in different age brackets by combining the field-survey data and certain data relating to the aggregate economy. It was assumed that the income-distributing potential of the urban sector of the United States economy at the present time depended upon the income-dynamics relationships. A measure of the degree of potential inequality of income in the urban sector could be obtained by examining the implications of the relationships. This was done by using a medium-speed electronic computer to find the size distribution of lifetime average annual income that would result in the urban sector of the economy if certain specified conditions prevailed. The process was repeated a number of times to see if the lifetime size distribution was sensitive to changes in these conditions.

The most important findings of this investigation were: (1) the income-dynamics relationships in the urban sector of the economy changed very little between 1949 and 1952; (2) the income-dynamics relationship can best be described by a set of first-order linear stochastic difference equations in the logarithms of income, with the important distinguishing characteristic that, since the slope coefficient is less than unity, a household's income depends directly upon its income in the immediately preceding year and indirectly upon its income in years preceding that, but its dependence on any particular year in the past becomes less and less important as time goes on; and (3) lifetime size distributions can be expected to exhibit less inequality than the size distribution for the whole economy for a one-year accounting period, and also less inequality than the size distribution for any particular age group for a one-year accounting period.

138 pages. \$1.85. Mic 56-1923

ECONOMICS, FINANCE

CAPITAL ALLOCATION CRITERIA IN
THE ECONOMIC DEVELOPMENT PLANS
OF UNDERDEVELOPED COUNTRIES

(Publication No. 16,888)

Michael Horace Belshaw, Ph.D.
Columbia University, 1956

The aim of this study is to examine and evaluate capital allocation criteria in the development plans of selected underdeveloped countries and, on the basis of the findings, to suggest an operational approach to the problem. To this end, development plans for British Honduras, India, Iraq and Nicaragua are summarized and the following theoretical propositions examined.

Equating the social marginal products of investments has no pragmatic applicability since the assumptions of fungibility and measurability are not met in the real world. Neither the capital-output ratio in its gross sense (capital turnover) nor in its net sense (capital productivity) is used for allocating capital although there is some indication that, had the planners so desired, these approaches could have been used, since the majority of the projects were amenable to output calculation. The planners seem to be aware that many projects are interrelated to each other for technological and economic reasons but little use is made of this phenomenon as a planning device. Although the allocation of capital appears to follow comparative advantage, this may be a coincidence since the planners make no explicit reference to the doctrine. In none of the plans does foreign borrowing play a large role, yet there is wide variation in the percentages of capital allocated to increasing exports and decreasing imports. This variation is a function of the size of the economic units, small countries requiring larger foreign exchange earnings than large countries since industrial production is limited by the small sizes of their markets. Labour intensive projects are generally thought to be desirable in under-developed countries but it is argued that there is no theoretical basis for determining the factor intensity of projects on an *a priori* basis and there is no predictable pattern of factor intensity in the plans themselves. The balanced growth hypothesis, used to explain the inhibitions upon direct investment in many countries can be taken as a policy directive for allocating capital over a wide range of investments in secondary industry. There is, however, no evidence that the planners took balanced growth into account. Cultural factors influence capital allocation by determining the objectives of expenditures and by necessitating the enhancement of a milieu favourable to economic growth but only to a small degree. The planners appear also to give priority to early investments for consumption goods and service facilities such as highways and electric power. In determining the role of industrialization in development programmes the planners paid little attention to their countries' comparative advantage positions or movements in the terms of trade although relative population densities and the absolute sizes of the countries' populations seem to affect decisions as to the desirability of industrialization. Capital is allocated to small-scale industry only in India apparently because of the excess labour supply which does not exist in the other three countries. While the use of the savings potential inherent in underemployed man-

power to create capital resources is thought desirable in densely populated countries this technique is not used, apparently because of the extensive investments needed to initiate the process. Political motives influence capital allocation but the extent is hard to detect. Similarly, ideas of social welfare and employment considerations are indicated to a slight degree.

It follows from the analysis that no consistent criteria, but rather a process of haphazard intuition, influenced planners in allocating capital and there is a need for a pragmatic and scientific methodology. Basing his conclusions upon the fact that the majority of the planners' projects have the effect of increasing production, the writer suggests an operational procedure for capital allocation using interrelationships and the net capital-output ratio.

387 pages. \$4.95. Mic 56-1924

ECONOMIC AND BANKING CHANGES IN
THE TWELFTH FEDERAL RESERVE DISTRICT,
1930-1952

(Publication No. 16,818)

Joseph William McGuire, Ph.D.
Columbia University, 1956

Between 1930 and 1952 major changes occurred in the Twelfth Federal Reserve District as the result of economic events, legislation, and Federal Reserve policies. The forces causing these changes, and the effects of these changes upon District institutions, particularly banking institutions, are examined in this dissertation.

Population growth and industrial development proceeded at a more rapid rate in the Twelfth District between 1930 and 1952 than in any other Federal Reserve District. This expansion substantially altered the economic and banking structure of the region. In 1930 the economy of the District was largely dependent upon natural resources, such as land, timber, and minerals. During the 1940's, stimulated by World War II and a vast influx of population, important markets evolved in the area, and fabricating and service industries developed rapidly. By 1952 the industrial base of the region had been greatly enlarged and diversified, and there were bright prospects for continued economic growth.

Important changes also took place in Twelfth District commercial banking between 1930 and 1952. The number of unit banks decreased considerably during this period, mainly as a result of suspensions, mergers, consolidations, and absorptions. Branch banking expanded rapidly in all states of the District after favorable legislation was passed in 1933. This widespread development of branch systems, more than any other factor, made the banking structure of the area unique. Commercial banking practices in the District were also changed significantly by the banking legislation of the 1930's, and by the pressure of economic events. As banking in the area became more concentrated, both in location and size, it tended to conform more closely to national practices, and to react to important changes in the same manner as banks elsewhere.

The Federal Reserve Bank of San Francisco changed considerably between 1930 and 1952. In 1930 the Bank still retained at least a semblance of its original purpose and

power: it was still among the major institutions determining significant credit policies for the District. In contrast, by 1952 the Bank's importance as a policy-making organization was negligible, and its chief duties consisted of routine activities and the administration of Federal Reserve policies in the region. For the most part this shift in function from policy to administration has not been publicly recognized by either the Bank or the Reserve System. The Bank still performs vital tasks for the District, but the changes that have occurred since 1930 have seriously curtailed its leadership abilities.

The effects of changes that occurred in banking in the Twelfth District during the depression of the 1930's, World War II, and the postwar inflation are analyzed and evaluated. Each of these periods, as it passed, left its mark upon the region. Overall, however, except for the first three years of the 1930's, continued growth has been the keynote of banking and industry in the District. This expansion should be maintained in the future.

824 pages. \$10.40. Mic 56-1925

ECONOMICS, HISTORY

LOCAL PUBLIC FINANCE IN COLONIAL CONNECTICUT

(Publication No. 16,906)

William Marcuse, Ph.D.
Columbia University, 1956

This dissertation describes local taxation and expenditure and examines the role played by local public finance in colonial Connecticut. The purpose was not only to describe the system but also to present in quantitative terms the level of local taxation in relation to that of the colony. Once quantitative estimates were available it was inevitable that some attempt be made to determine the tax burden and to briefly examine this burden, colonial and local, in comparison to that of pre-Revolutionary England.

The study was organized as follows: (1) A description of colonial Connecticut with emphasis on the division of public functions between various governmental units, a discussion of the structure of the political and landholding systems, and an examination of the institutions for raising and spending funds on the local level; (2) A thorough examination of the methods of raising revenue; (3) A factual description of local expenditures; (4) A quantitative estimate of local finance; (5) A determination of the tax burden and an evaluation of the tax system in terms of burden, complexity, ability and benefit theories, incentive uses of the fisc, and the reaction of the taxpayers.

Most public funds were raised by a tax rate laid upon a tax base common to all levels of government. This tax base--the grandlist--was composed of property, polls, and faculties. The property assessments were on land, valued on the basis of use and, to some extent, location, and moveable property, partly assessed at fixed amounts and partly at the discretion of the taxpayer and the assessor. Throughout most of the colonial period the assessment for polls was a fixed amount which was included in the grand list.

The faculty tax was similar to the poll with the amount of assessment varying depending upon the taxpayer's profession or business. All of these assessments had most likely originally been an attempt to measure the gross product of land, capital, and talent or training. In addition to taxes placed upon this comprehensive tax base towns used the assessment of required "working-days" for the construction of highways, bridges, and public works, and all men were required to serve six days each year for military training.

Local expenditures were primarily for the support of the church and the minister. In addition, the locality paid bounties to which the colony contributed, maintained a stock of ammunition and a guard, supported their own poor, operated schools, and occasionally paid small emoluments to town officials. Highways and public works were financed by compulsory labor services and land or money grants were sometimes used to encourage the settlement of useful neighbors, e.g. the blacksmith.

The only feasible method of arriving at quantitative estimates was the technique of building a model of a typical town. For the seventeenth century one model was sufficient. Once this hypothetical community was endowed with typical characteristics, expenditures could be allocated and tax rates computed. The eighteenth century required three model towns because of differences in development, age, size, and location. Models of the ecclesiastical society were also necessary since these were the eighteenth century taxing and spending units for church, minister, and school. The technique used was to sample towns and societies to arrive at typical tax rates and then apply these to the typical grandlists to determine taxes raised and monies expended.

The final conclusions were: (1) local taxes in peacetime were about four times as great as colony taxes; (2) the church and related activities absorbed two-thirds to four-fifths of all local expenditures; (3) the burden of taxation was light although heavier than generally believed; (4) in comparison to England not only was the burden lighter but the system was much simpler; (5) the tax system was apparently considered just and equitable both in theory and practice; (6) the tax system was not consciously used to any great degree to encourage economic activity.

341 pages. \$4.40. Mic 56-1926

ECONOMICS, THEORY

THE 1949 DEVALUATION OF THE POUND STERLING

(Publication No. 16,824)

Gerald Sirkin, Ph.D.
Columbia University, 1956

The devaluation of the pound sterling in 1949 raised important questions regarding the appropriateness of devaluation under the conditions existing at the time. This study attempts to assess the wisdom of the action by an examination of the results.

Part I presents a survey and critique of the theory of exchange rates as an equilibrating device. The familiar

analysis of stability conditions in terms of price elasticities is reviewed, and the severe limitations of this approach, owing to both the inadequacy of simple elasticity concepts in dealing with the movement of the whole economy toward a new equilibrium and to the unreliability of our empirical measures of elasticities, are discussed. The theoretical analysis also covers (1) the "income-absorption" approach (referring specifically to the necessity of curtailing home absorption of product in order to improve the foreign balance when national output is at a maximum); (2) the effect of devaluation on prices and terms of trade; (3) the interrelations of devaluation, internal contractionary financial policy, terms of trade, and the foreign balance.

Since the appropriateness of exchange-rate adjustment depends not only on the nature of the equilibrating effects to be expected but also on the type of balance-of-payments disequilibrium which is to be corrected, an examination is made of kinds of balance-of-payments disequilibria and the problems of identifying the kind present in a particular situation. Exchange-rate adjustment is considered suitable only in the case of a "fundamental" disequilibrium in the balance of payments. A study of the British balance of payments leaves strong doubts that her balance-of-payments problem was of the "fundamental" type.

Though basically the British devaluation was considered to be a measure for correcting a persistent balance-of-payments disequilibrium, it was actually touched off by the foreign-exchange crisis of 1949 which stemmed principally from a wave of speculation against the pound. Devaluation thus had the dual aim of halting the speculation and of correcting the underlying disequilibrium in the balance of payments. Against these possible gains must be set the costs of devaluation, primarily the loss of income through any worsening in the terms of trade that might result from devaluation. In weighing the possible gains and costs, atten-

tion is called to available alternatives, particularly the use of a "floating" exchange rate to deal with the adverse speculation.

Part II investigates the short-run effects of devaluation, covering the period to the outbreak of the Korean War in June, 1950. The evidence suggests that, aside from stopping the speculation against the pound, the devaluation had but negligible beneficial effects on Britain's foreign balance. The appearance of an improvement in the British position, especially in the gold and dollar reserves, can be shown to have been due, not to the price effects of devaluation, but to tighter import controls by Britain and the Rest of the Sterling Area, the recovery of the American economy from the 1949 recession, the reversal of the speculative outflow of sterling, and a net improvement in certain "invisibles" not related to devaluation.

Offsetting these meager achievements was the terms-of-trade cost of devaluation which, based on estimates of the effect of devaluation on British import and export prices, proved to be substantial.

An examination of the longer-run period, extending through 1953, shows that the lowering of British costs and prices through devaluation was retained relative to the United States but not relative to the costs and prices of Britain's main European competitors. No significant improvements in Britain's balance of payments which can be attributed to devaluation are found in the longer period.

The chief conclusion to be drawn from the British experience is not, however, that exchange adjustment is ineffective as an equilibrating mechanism, but that it will be ineffective and perhaps costly when carried out under such inflationary conditions as prevailed in the British economy in 1949, and without adequate support in the form of fiscal and monetary contractionary policies.

300 pages. \$3.85. Mic 56-1927

EDUCATION

EDUCATION, GENERAL

THE ASSOCIATION OF SUBJECT PREFERENCE WITH ACCOMPLISHMENT IN SELECTED SCHOLASTIC AREAS OF EIGHTH GRADE PUPILS

(Publication No. 16,505)

Charles Edward Davis, Ph.D.
University of Pittsburgh, 1956

This study was an attempt to determine whether students' relative preference for elementary school subject areas correspondingly influenced accomplishment in those areas. Thorndike¹ as early as 1912, studied this problem, but the period intervening to the present has yielded much confused and little precise information. This study is parallel to other studies now being carried on² but differs in that it deals with elementary school studies and pupils. To test the hypothesis that a real and positive relation between relative accomplishment and relative subject preference

existed, required that measures of mental ability, accomplishment, and subject preference be obtained. A total of 320 eighth-grade pupils were included in the experimental population, taken from eight schools of varying philosophy and type of community.

The necessary data were obtained by the use of the following instruments: The Pintner-Durost Test of Mental Ability, the Stanford Achievement Test (Advanced Battery), and a subject preference inventory developed for this study. This instrument was based on the assumption that students must make choices in scholastic behavior. Thus it was directed toward the general scholastic areas of mathematics, science, language, social studies, fine arts, and manipulative arts which embrace the school program. In a pilot study the split half reliability of the instrument for these four academic areas covered in this study was found to be 90, 91, 91, and 83, respectively.

The statistical treatment of the data involved the following analyses:

A. The determination of the intercorrelation of the three variables, independently and in multiple. Table I gives the results of these analyses:

The items following each abstract are: the number of manuscript pages in the dissertation, its cost on microfilm, and the Library of Congress card number. Enlargements 5-1/2 x 8-1/2 inches, 10 cents per page. No postage is charged if check or money order accompanies order.

TABLE I
THE ASSOCIATION OF ACCOMPLISHMENT,
MENTAL ABILITY, AND SUBJECT PREFERENCE

	Mathematics	Science	Language	Social Studies
rx _y	.66	.57	.68	.69
rx _z	.30	.20	.19	.07
ry _z	.10	-.06	.03	-.04
R _{x(yz)}	.70	.62	.71	.70

Legend: x-accomplishment; y-mental ability; z-subject preference

These analyses revealed the following: The association of accomplishment with mental ability was found highly correlated and statistically highly significant in each of the four areas; the association of subject preference with accomplishment was lower but was significant at the one per cent level of confidence in each area except social studies; the correlation of subject preference with mental ability was very low, indicating insignificant relation between subject preference and mental ability in this population sample. The multiple correlation coefficients of accomplishment with subject preference and mental ability exceeded all of the independent correlations in each of the four subject areas but were statistically significant at the five per cent level for but two subjects, mathematics and science.

B. The second analysis involved the determination of the proportion of students with high subject preference who achieved above and below the level expected according to their mental ability level. A corresponding analysis was made for pupils with low subject preference. For each subject area the students who had the highest and lowest 23 per cent of the subject preference scores were studied. The results were that, on average, the chances were about two in three that a pupil with high preference for a subject would achieve at or above expectancy as based on his mental ability; for those with low preference only one in three equaled or exceeded expectancy.

C. The third analysis involved the determination of the difference in accomplishment of student pairs matched for mental ability but having contrasting scores above and below mean acceptance of a subject area.

The mean differences in accomplishment of the contrasting pairs were found to be highly significant in all subject areas but social studies.

The findings of this study may briefly be summarized as follows:

1. Relative subject preference is a factor that is strongly related to accomplishment in mathematics, science, and language in the elementary school pupils. The findings for social studies were less conclusive.
2. Relative subject preference interacts with relative mental ability to influence accomplishment both positively and negatively.
3. Relative subject preference does not appear to be closely associated with levels of mental ability, in the several subjects.

96 pages. \$1.20. Mic 56-1928

1. Thorndike, E. L., "The Permanence of Interests and Their Relation to Abilities", *Popular Science Monthly*, 1912, 41, 449-456.

2. Sones, W. W. D., Agenda for General Study of the Influence of Students' Subject Preference on Their Scho-

lastic Accomplishment. Curriculum Laboratory Memorandum, University of Pittsburgh.

A STUDY OF THE VARIATION IN ACCOMPLISHMENT AND SUBJECT PREFERENCE IN DIFFERENT SECONDARY SCHOOLS

(Publication No. 16,507)

Henry Madison Eldridge, Ed.D.
University of Pittsburgh, 1956

I. SETTING AND DEFINITION OF PROBLEM

This study is one of a group of related studies¹ re-examining the influence on scholastic accomplishment of relative student preference for the different scholastic fields of study. It was proposed in this study to examine the variation in different high schools of relative subject preference and relative subject accomplishment. Both Davis² and Shepler³ have shown that accomplishment of students in particular subjects is positively related to degree of subject preference. These findings suggest the question: Is it possible that within individual schools there is variation from one subject department to another in degree of subject preference which is associated with degree of general accomplishment in these fields; also among schools is there variation in relative preference and accomplishment in given subject areas?

These questions led to the hypothesis, that: the average level of subject preference varies among schools for different subject areas, and the average level of accomplishment in these areas shows correspondence with these average levels of preference. The hypothesis was tested in relation to mathematics, science, social studies, and language subject areas.

II. STUDY DESIGN AND PROCEDURE

Based on the assumption that relative subject preference and accomplishment within a school would best be reflected by information gathered from upper-class students 11th- and 12th-grade students were used as experimental subjects. A total of 1087 students distributed in three 11th grades and three 12th grades in six different high schools were used to obtain the data which were analyzed.

The measures taken from each student were: accomplishment in each of the four academic fields by means of the Harry-Durost Essential High School Battery; measures of relative subject preference in the four academic areas together with fine arts and manipulative arts by means of a research instrument designed for this and companion studies; and measures yielded by the Terman-McNemar test of mental ability. The measures were made cross-comparable by resolution to standard scores with a common base of means and variances. In the analysis the two grade levels were treated separately in relation to accomplishment but pooled as to subject preference levels.

The mean scores in mental ability of all of the six grade groups were above mean expectancy as indicated by the norms of the Terman-McNemar test. Since the central concern in this study was variation in the variables within individual schools no use was made analytically of measures of mental ability.

The criteria devised to appraise relative subject preference and relative subject accomplishment in the different schools were: (1) mean values of the variables for the total grade populations in each school without regard for curriculum in which students were enrolled; (2) mean values for variables for students in academic and general curriculum because of their closer contact with four fields being studied; (3) relative proportion of students in different schools in top and bottom 23 per cent of subject preference and accomplishment scores after statistical adjustments were made for varying sizes of school samples contributing to total samples. These three general forms of analysis provided twelve criteria for appraising the relative subject preference and relative subject accomplishment in the six high schools. In the application of the criteria, for each of the subject fields, there were three ratings—above average, at average, and below average—for both subject preference and subject accomplishment.

III. FINDINGS AND CONCLUSIONS

The hypothesis tested in this study that relative preference for the different scholastic fields varied within individual high schools, and that there was correspondence between relative subject accomplishment and relative subject preference within individual schools, was strongly supported by the evidence collected. This evidence may be summarized as follows:

1. In each of the high schools there was a unique pattern of subject preference and subject accomplishment as rated high, middle, and low. Among the six high schools highest preference was given mathematics by two, science by two, social studies by two and language by one (one tie rating); lowest preference was given mathematics by three, science by none, social studies by three, language by two (two tie ratings).
2. In pairing ratings of subject preference and subject accomplishment (the latter appraised by standard norms of the achievement test) for the four subjects in the six schools, out of 24 possible pairs of ratings there were 15 in which there was correspondence. This is almost six times chance expectancy if it is noted that there were three rating levels for each variable. This statistical significance level was greater than .01; this indicates the highest probability that the correspondents of ratings were not due to sampling error.

The findings of this study have both practical and theoretical implications. In the practical situation it appears that the measurement of relative subject preference would be an enlightening means of internal examination of individual schools. On the theoretical side the findings suggest the need for further study for identifying the factors related to variable subject preference.

72 pages. \$1.00. Mic 56-1929

1. Sones, W. W. D., *Agenda for General Study of the Influence of Students' Subject Preference on Their Scholastic Accomplishment*. Curriculum Laboratory Memorandum, University of Pittsburgh.
2. Davis, C. E., *The Association of Subject Preference with Accomplishment in Selected Scholastic Areas of*

Eighth Grade Pupils. Ph.D. Thesis, University of Pittsburgh (1956).

3. Shepler, W. D., *The Study of Scholastic Achievement in Secondary School Science in Relation to Pupil's Relative Preference for this Subject*. Ed.D. Thesis, University of Pittsburgh (1956).

SOCIAL AREA ANALYSIS AND ELEMENTARY SCHOOL PROBLEMS IN AN URBAN COMMUNITY

(Publication No. 16,836)

Myron Henry Schussman, Ed.D.
Stanford University, 1956

This study investigates the social characteristics of the elementary school attendance areas in an urban community, relationships of these social characteristics to elementary school problems, and the implications of such relationships for educational practice.

Indices of economic, urban, and ethnic status are developed for twenty-three school neighborhoods, using the Shevky and Bell typology for social area analysis.¹ This technique provides indices derived from census tract data: higher economic status is associated with higher occupational and educational level; higher urban status is indicated by smaller families, more women working, and more multiple-family dwellings; higher ethnic status is derived from a larger proportion of colored and/or foreign-born white persons from Mexico, southern and eastern Europe, and Asia.

Educational variables showing the relative position of each elementary school in parent-school relations, teacher attitudes toward school, pupil physical factors, emotional factors, intelligence, communicative ability, and achievement, are correlated (using the Pearson "r") with each of the social status indices. Table 1 shows selected correlations.

Major conclusions are: (1) The Shevky and Bell technique is a convenient and effective method of analyzing social characteristics of school neighborhoods in terms which are useful to educators. (2) Social characteristics of neighborhoods are significantly related to: parental attitudes toward school; pupil responses to social control in school; pupil intelligence, communicative ability, and achievement. (3) Social status indices are not significantly related to: teacher attitudes; pupil health; pupil physical defects. (4) Neighborhoods with higher economic status, lower urban status, and lower ethnic status tend to have a social climate more favorable to school success.

The educational implications are immediate, practical, and urgent. The public elementary schools are the "common schools" of American democracy; educators should agree upon common purposes and accept cultural variations within this universal frame. Rather than representing any one segment of the social structure, the school should adapt its practices to the needs and character of the entire society and all of the sub-groups within the society which it serves. Those who teach, supervise, and administer an educational program must govern their actions in consideration of the pupils who come to school and the families and neighborhoods which these pupils represent.

TABLE 1
EDUCATIONAL VARIABLES FROM
RICHMOND ELEMENTARY SCHOOLS CORRELATED WITH
SHEVKY AND BELL SOCIAL STATUS
INDICES OF SCHOOL ATTENDANCE AREAS

Educational Variable	Product-moment coefficient of correlation between educational variable and social index:		
	Economic Status	Urban Status	Ethnic Status
Parent-school relations			
Parents attending conferences, 1953-1955 M = 88.1 s.d. = 6.4	+ .67**	- .37	- .67**
Pupil days absent due to illness, 6-yr. average M = 6.4 s.d. = 1.3	+ .70**	- .51*	- .41
Pupil days attendance, 6-yr. average M = 90.1 s.d. = 1.3	+ .01	- .05	- .27
Pupil days not enrolled, 6-yr. average M = 2.2 s.d. = 1.0	- .45*	+ .49*	+ .17
Pupil days absent not due to illness, 6-yr. average M = 1.3 s.d. = 0.6	- .63**	+ .36	+ .53*
Teacher attitudes			
Teacher days absent due to illness, 1949-1950 M = 4.5 s.d. = 1.8	- .05	+ .06	+ .06
Pupil physical factors			
Hearing defects, 20 db. loss, 1954 M = 1.1 s.d. = 0.5	- .28	+ .27	+ .04
Pupil emotional factors			
Guidance referrals, "behavior", 5-yr. average M = 57.4 s.d. = 21.9	+ .49*	- .24	- .59**
Referrals to school psychiatrist M = 4.5 s.d. = 3.7	- .49*	+ .32	+ .56**
Pupil intelligence, communicative ability, achievement			
I.Q., Kuhlmann-Anderson, grade five M = 96.1 s.d. = 6.1	+ .88**	- .76**	- .77**
Reading achievement, Stanford, grade 3 M = 7.5 yrs. s.d. = 0.4	+ .77**	- .48*	- .59**
Reading achievement, Stanford, grade 5 M = 9.4 yrs. s.d. = 0.7	+ .74**	- .64**	- .60**
Reading readiness, Gates, grade one M = 55.8 s.d. = 11.8	+ .75**	- .66**	- .60**
* P < .05 ** P < .01 N = 18 to 23 schools			

169 pages. \$2.25. Mic 56-1930

1. Eshref Shevky and Wendell Bell, Social Area Analysis: Theory, Illustrative Application and Computational Procedures. Stanford, California: Stanford University Press, 1955.

EDUCATION, ADMINISTRATION

A STUDY OF SELECTED DATA RELATIVE TO THE EDUCATION OF TEXAS TEACHERS OF SECONDARY SCHOOL MATHEMATICS IN ORDER TO SUGGEST A PROGRAM FOR THEIR FUTURE EDUCATION

(Publication No. 16,795)

Sister Mary Matthew Donovan, Ed.D.
University of Houston, 1956

This study was made with two purposes in view. The first purpose was to investigate the opinions and attitudes of teachers of secondary mathematics, secondary school administrators and college professors of mathematics, concerning an adequate preparation of teachers of mathematics in the secondary schools of Texas. The second purpose was to study and evaluate all of the data gathered in order to draw up a program which might suggest ways and means of imparting to prospective teachers of secondary mathematics the preparation they need.

Information was obtained by means of questionnaires sent to three hundred teachers of secondary mathematics and two hundred secondary school administrators and college professors. One hundred fifty-one teachers, sixty-five administrators, and thirty-five college professors responded. Another source of data was the study of reports, programs and research papers pertaining to the education of mathematics teachers for secondary schools.

Although opinions varied as to the most effective program for teacher preparation, the recommendations in this study have been selected from those which appeared to be based on principles which are both sound and practical. These are as follows:

1. Emphasis should be placed on a broad general education, which should include courses in art and music, religion and philosophy.
2. Courses related to the development of good citizenship and right social living ranked high in importance in teacher preparation.
3. There was a general agreement on the value of courses in algebra, geometry, calculus, trigonometry, and history of mathematics.
4. Applied mathematics was recommended rather than pure mathematics.
5. As an adequate division of hours toward graduation a minimum of seventy hours in general education, twenty-four in mathematics, and twenty-four in professional courses was suggested.
6. It was considered sound pedagogy for methods courses to be taught by a member of the mathematics department who had had experience in the teaching of secondary mathematics, or by a dual professor responsible to both the department of mathematics and the department of education.
7. Professional courses should be given during the junior and senior years.
8. Student teaching should cover one year.

9. College teachers of mathematics have a responsibility for creating in the students an enthusiasm for mathematics and a desire to teach it.

Recommendations:

1. Courses designed to equip the teacher with a field of general knowledge are: English literature, grammar and composition, science, health, United States history, government, religion, sociology, philosophy, art and music appreciation, foreign language, history of early civilizations and speech.
2. Courses designed to help the teacher professionally are: Introduction to education, child growth and development, psychology of learning, adolescent psychology, secondary school curriculum, tests and measurements, and methods courses taught by a professor of the mathematics department, who is an expert in the field of teaching secondary mathematics.
3. One year of student teaching is recommended, with emphasis in the beginning placed on observation and short periods of actual teaching, followed by diagnostic conferences. As the student progresses, the time devoted to actual teaching should be increased until he reaches the point of being able to assume full responsibility for the class.
4. Courses designed to give adequate mathematical knowledge are: Algebra, trigonometry, analytic geometry, calculus, college geometry with an introduction to non-Euclidean geometry, history of mathematics, theory of numbers, theory of equations, and descriptive geometry.
5. Courses in mathematics should be so interrelated that the student may have a thorough, systematic, and sequential training and may realize that each course he takes fits into the necessary program toward his mathematical education. This interrelation should enable the student to understand what mathematics is and enable him to think mathematically.

159 pages. \$2.00. Mic 56-1931

TECHNICAL TRAINING NEEDS OF SELECTED ARKANSAS INDUSTRIES

(Publication No. 16,781)

Vincent Rogers Faulds, Ed.D.
University of Missouri, 1956

Major Adviser: H. H. London

Purpose of Study: The purpose of this study was to ascertain the need for trained technicians in selected Arkansas industries, whether or not existing educational institutions are meeting the need, clusters of occupations for which technical curriculums should be provided, and to suggest principles, procedures and geographical locations for establishing needed curriculums.

Methods of Research: Data for the study were obtained from 159 employers in the nineteen selected Arkansas industries who returned usable information forms which

were mailed to them, from analyses of U. S. Census reports and literature in the field, and from personal interviews with employers and educators in Arkansas. Estimates of needs and suggestions for establishing technical curriculums were made on the basis of these data.

Summary: Manufacturing employment in Arkansas increased by 47.8 per cent between 1940 and 1950, and the fifteen selected manufacturing industries comprised 91.3 per cent of the 1950 manufacturing employment in the state. For the same period, employment in the four selected nonmanufacturing industries increased by 88.5 per cent.

The establishments in the sample represented 24.5 per cent of the total employment in the selected industries. The manufacturing sample employed 21,933 persons and the nonmanufacturing sample 9,908. These represented 28.20 per cent and 18.96 per cent of their respective industry groups.

In the manufacturing sample, 1,789 technicians made up 8.16 per cent of the total employment and 1,051 technicians represented 10.6 per cent of the total employment in the nonmanufacturing sample. There were an estimated 10,558 technicians employed in the nineteen industries in Arkansas, with an annual need for 528 replacements.

Thirteen clusters of technical occupations were identified in the selected industries in Arkansas. In six of these --chemical, mechanical, industrial electrical, industrial, construction, and wood and lumber technologies--a need for corresponding technical curriculums was ascertained. An enrollment of 822 students was estimated for these curriculums.

Existing educational institutions in the state appeared to be making some indirect contribution to technical training, but no curriculums designed to meet the needs of the selected Arkansas industries were found.

Eight principles and twelve steps of procedure were suggested to guide the development of technical curriculums in Arkansas. Geographical locations were also suggested for each of the six proposed curriculums.

Conclusions: The selected manufacturing and related nonmanufacturing industries have been expanding rapidly and are playing an increasingly important role in the economy of Arkansas.

There is an apparent need for technical training in Arkansas to meet the technical employment requirements of these industries.

The existing educational institutions of the state are not doing an adequate job of technical training to meet the needs of the selected Arkansas industries.

The need for trained technicians in Arkansas is sufficiently large to justify the establishment of additional technical curriculums in the state.

Facilities exist within the educational institutions of the state which could be utilized in establishing technical curriculums.

Existing training facilities and technical employment patterns suggest rather definite geographical locations for technical curriculums in Arkansas.

167 pages. \$2.10. Mic 56-1932

A PERCEPTION OF ELEMENTARY SCHOOL SUPERVISORY ROLE

(Publication No. 16,834)

Charles Spurgeon Knight, Ed.D.
Stanford University, 1956

The purpose of this study was to examine the perceptions held by supervisors and principals of the elementary school supervisory role, to compare and contrast the perceptions held by each group, and to suggest implications for education of any differences that might exist.

A review of the literature indicated that the supervisor-principal relationship is one involving tension and conflict potentials. For purposes of this study it was assumed that these tensions and conflicts were caused by disagreement about some aspects of the supervisor's role.

To achieve a behavioral definition of the supervisor's job the Critical Incident Technique was employed. Using this technique 47 principals and 36 supervisors were interviewed. From the 83 interviews 154 incidents were obtained from supervisors and 206 from principals. An analysis of the incidents indicated the following major aspects of the elementary school supervisor's job.

- I. WORKING WITH AND HELPING PRINCIPALS
- II. WORKING WITH PARENTS AND PARENT GROUPS
- III. WORKING WITH AND HELPING TEACHERS
- A. Directing and Guiding the Improvement of the Instructional Program
- B. Meeting the Needs of the Teaching Personnel
- C. Working with Teacher Groups

Analysis identified twenty-three critical behaviors of effective supervision. Of these 23 criteria only three were developed from critical behaviors reported by both supervisors and principals. Of the remaining twenty, principals found fourteen to be critical, while supervisors found six of them critical. Thus, analysis of these data seems to indicate that there is lack of agreement between supervisors and principals as to their perceptions of the elementary school supervisory role.

On the basis of this general conclusion as well as those drawn from a detailed analysis of each critical behavior the following recommendations are made to improve and strengthen the understanding of principals and supervisors of the job of the central office staff elementary school supervisor, and through such understanding to build a better relationship between the two groups.

1. There is need for closer day to day communication between supervisors and principals to establish a better understanding of the supervisor's position and work in each school.
2. Consideration should be given to examining more thoroughly ways in which supervisors can be effective in helping principals and teachers work with parents.
3. The problem of the evaluation of teachers by supervisors should be studied by all interested groups in order to provide effective approaches to the evaluation of the instructional program as a whole and the teaching staff in particular.
4. The problem of supervisory attitude and problems of interpersonal relations generally, should be examined

carefully with the intention of developing criteria for the selection and training of individuals as supervisors who can perform effectively in these areas.

5. There is need for the development of programs of orientation for principals and supervisors by training institutions and school districts to develop an understanding of the supervisors' role in a district.

6. A similar study made on a state-wide basis should provide invaluable data that would be useful in the selection and training of potential supervisors.

7. Principals and supervisors should attend together workshops and conferences devoted to the improvement of supervisory practices.

8. Continual evaluation and examination of the supervisory program by studies similar to the present one should be carried on.

9. Other studies now in progress at Stanford examining the supervisors' work should be brought together with the present study to provide a more complete picture of the position of the supervisor in the educational program.

171 pages. \$2.25. Mic 56-1933

EDUCATION, HISTORY

THE SETTLEMENT, THE IMMIGRANT AND THE PUBLIC SCHOOL: A STUDY OF THE INFLUENCE OF THE SETTLEMENT MOVEMENT AND THE NEW MIGRATION UPON PUBLIC EDUCATION: 1890-1924

(Publication No. 16,798)

Morris Isaiah Berger, Ph.D.
Columbia University, 1956

Historians of education have long been aware that the turn of the present century marked a transformation of the American public school. In attempting to explain this transformation, they have given extensive attention to such obvious factors as industrialism, Progressivism, Pragmatism, and the findings of educational research. Little if any attention, on the other hand, has been accorded the specific and direct influence of the social settlement and the immigrant. The result has been an unfortunate omission and a consequent imbalance in most interpretations of recent educational history.

The social settlement arose as a reaction to the evils of industrialism. It was born of an effort by socially conscious reformers to combat the ugliness, the poverty, and the social disintegration of the urban slum. Its goal was nothing less than a total regeneration of the slum neighborhood—a regeneration whose character was first and foremost educational. The settlement was to be the center of a new self-conscious community; and from this center the people were to draw their strength.

From the first, settlement workers viewed their efforts as experimental rather than permanent. Their underlying motive was ultimately to transfer their program to the public school. By proving the worth of community centers, adult education, and social service, they hoped to build their idea permanently into the structure of public education.

Their endeavors were well rewarded, for the early decades of the twentieth century saw the gradual, though often reluctant, acceptance of the settlement idea into educational theory and practice.

To work in slums was to work with immigrants; their very numbers made it impossible for reformers to ignore their presence. The settlement, concerned as it was with the evils of industrialism, soon found that its clientele was predominantly foreign born; its program thus became, in large part, an attempt to help immigrants. These strangers who huddled together in ethnic communities, who spoke unintelligible tongues, and who often dressed differently, challenged a young and virile "Americanism." Something had to be done to change them. Again, the public school felt the pressure of an outside force; the immigrant engendered the demand to make the school an Americanizing institution. When the public school did accept the responsibility, it found itself attempting much the same program as the settlement.

Here then were two significant pressures that caused the school to change. The social settlement, concerned with problems of industrialism, fought to make the school a center of community life for child and adult. The immigrant, posing the problem of being different, compelled the school to shape a program that would remove the difference. Coupled with these two forces were those that have already received extensive discussion in the literature. The "new education," revolting against traditional content and formalized methods, demanded a twentieth century school to meet twentieth century needs. The thinking of a newly industrialized society prodded the public school to consider itself in terms of a business enterprise to be fully exploited—to be fully utilized night and day, summer and winter. The democratic ethic demanded a new kind of school house truly common to all the people—a school house that not only transmitted the culture of the society, but that also prepared all children for active citizenship, that served as a civic center, a clubhouse, and a place for relaxation.

Brought together, these forces evoked a common cry for a new kind of public education; and as the school bent to this demand, one of the mainstreams of contemporary educational thought emerged. This study describes the transformation. It begins by briefly describing the beginnings of the settlement movement, its activities and aspirations. An analysis is then made of the impact of the new migration upon American society and the close connection of the settlement movement with this migration. The history of the Educational Alliance, an institution that combined settlement work with immigrant education, follows as a case study. The impact of the settlement movement and the new migration upon public education is subsequently considered. Finally, the study shows how settlement work and the activities of immigrant institutions coalesced with other forces to support the movement to make the public school the center of community life.

196 pages. \$2.55. Mic 56-1934

EVOLVING CONCEPTS OF INDUSTRIAL EDUCATION IN THE THINKING OF THE INDUSTRIAL EDUCATOR

(Publication No. 16,782)

Robert Grove Hammond, Ed.D.
University of Missouri, 1956

Major Adviser: Dr. H. H. London

Purpose of study:

To trace the evolution of certain underlying concepts of industrial education in the thinking of industrial educators which have affected the growth and expansion of the program, and to analyze and interpret the ideas of industrial educators toward certain major issues involved in the program of industrial education as it has developed in America.

Method of research:

A study was made of the individual writings of persons of recognized status directly connected with the industrial education movement, official publications of state and federal governmental agencies, and proceedings and annals of selected organizations.

Summary:

1. Industrial school education has consistently been viewed by its advocates as a multi-purpose area in education. It continues to be supported as a two-phased program in which industrial arts is primarily thought of as a part of general education and vocational-industrial education as training for productive employment in the trades and industries.
2. Industrial education under school auspices has been centered, from the beginning, around the concepts that students learn best through active participation and that productive activities serve as means of mental growth and as aids in the acquisition of factual content.
3. The American concept of industrial school education began with the acceptance of manual training as vocational education. Influenced by later European and American ideas and concepts, American industrial education aims at increasing the appreciation and understanding of our industrial society, vocational competency, and successful citizenship.
4. Vocational-industrial educators generally have been sympathetic with pre-employment programs of training that tend to increase the occupational mobility of workers.
5. There has been general agreement among industrial educators that the objectives of industrial arts must show a definite relationship to the aims of general education.
6. Industrial educators have invariably looked to industry as the fundamental source from which to select the subject matter for industrial arts courses.
7. Some form of analysis has consistently been relied upon by industrial educators in the selection of subject content.
8. Industrial educators have proposed two basic types of shop organization for industrial arts instruction. The unit shop is the most stable of the two, there having been little diversity of opinion concerning it.

The rapid growth of the second form, the general shop, has been characterized by many variations in opinion and concepts.

9. It has been consistently acknowledged that the differences between industrial arts and vocational-industrial education are mainly of aims, administration, and teaching methods. The two are viewed by leaders in the field as complementary parts of a whole, each supplementing and strengthening the other.

10. Early demands for a dual system of support and control in public education have generally given way to more modest requests justifiable under local conditions. However, there has been no weakening of the vocational educator's position regarding the earmarking of funds for vocational educational purposes.

11. The industrial educator's concept of guidance and vocational-industrial education has expanded to include them as indispensable phases of a total program of occupational adjustment.

Recommendations:

1. Industrial educators should strive to work more co-operatively with each other, with labor, with management, and with the general educator in order that the common cause of a sound, well-balanced educational program might be furthered.

2. Emphasis in industrial arts should be placed on those objectives which are unique to this phase of general education.

3. The manipulative experiences involving a wide range of materials and tools should continue to be stressed in industrial subjects.

4. Industrial educators should encourage the use of the best guidance techniques in the selection, training, placement, and follow-up of vocational students.

292 pages. \$3.65. Mic 56-1935

EDUCATION, PSYCHOLOGY

RETURNS SOUGHT FROM ADULT WORK BY EARLY ADOLESCENTS, IN RELATION TO SOCIOMETRIC STATUS AMONG PEERS

(Publication No. 16,897)

Junius Ayers Davis, Ph.D.
Columbia University, 1956

This study explored relationships between degree of acceptance (sociometric status) of early adolescent males among their peers, and (a) readiness to report returns or rewards sought in adult work, and (b) emphasis on different kinds of returns sought in adult work.

Subjects were drawn from a group of 128 eighth grade and 142 ninth grade boys, the entire male public school population in these grades in a town of about 23,000 population. A random sample of 97 eighth grade and a sample of 90 ninth grade boys selected with no known biases were used in the study of relationships between sociometric status and readiness to report returns sought in work in vocational planning interviews, and the study of relation-

ships between sociometric status and particular returns sought in work as revealed in the same interview. A group of 99 ninth grade boys was used to test relationships between sociometric status and the inventory-derived returns scores.

The measure of sociometric status was a rating scale patterned after the Cunningham Classroom Social Distance Scale and developed for this study; criteria were drawn from a content analysis of a tape-recorded vocational planning interview, and a paired-comparisons work values inventory. Other variables studied included Mental Age (from the Otis QS, Form Beta), Chronological Age, Adjustment (as measured by the Rotter Incomplete Sentences Blank), and Socioeconomic Status.

Correlation coefficients as demanded by the hypotheses and as permitted by the data were computed among sociometric status, the returns indices, and the other variables studied. The relationships found were tested for significance. There was some evidence that a significant but slight relationship exists between sociometric status and variety of returns sought from work, although this appears to be due to the common dependence of both variables on a third variable (intelligence). Although individual differences in returns desired from work were found, no strong evidence of relationships among sociometric status and such returns was discovered. This may be due to the questionable validity of the instruments used to tap the values data; it was felt more likely that the question of the meaningfulness of such value statements for early adolescents is involved, as the hypotheses did not hold up for either of the two criteria, and as the criteria did not agree with each other. The hypothesis of differential return expectation from aspired adult work role can be neither accepted nor rejected.

It was tentatively concluded that either (a) no relationship exists between sociometric status and returns sought in work at this age, and that value-type considerations in vocational preferences may not be meaningful until later in adolescence; or (b) validity limitations of techniques used to solicit returns sought in work preclude significant findings. Study of the meaningfulness of work values as well as development of adequate assessment techniques is indicated.

110 pages. \$1.50. Mic 56-1936

ATTITUDE CHANGES ASSOCIATED WITH A TWO-YEAR COLLEGE EXPERIENCE

(Publication No. 16,856)

Walter Thomas Plant, Ph.D.
Stanford University, 1956

Statement of the Problem

The primary problem of this study was to determine whether or not a significant change in ethnocentrism occurred during the first two years of a student's residence in college. Several secondary problems had to do with the determination of factors associated with a change in ethnocentrism.

Procedures

Ethnocentrism was defined in the terms used by the authors of The Authoritarian Personality, and the instrument

selected to measure ethnocentrism was "The Total Ethnocentrism Scale" (modified by the deletion of two items) from *The Authoritarian Personality*.

This scale was administered to 1,049 students applying for admission to San Jose State College in May of 1953. Of this original group, the scores of 1,030 were usable and initial statistical treatment of these 1,030 scores indicated that there was a significant sex difference in ethnocentrism, and that measures of intelligence and of ethnocentrism were significantly correlated.

In May of 1955, 755 of the original group were re-tested with the E-scale. Five hundred and five of the 755 subjects re-tested had been enrolled at San Jose State College for the two-year period. The remaining 250 had discontinued their college programs before completing two years or had not enrolled after initiating the matriculation procedures. The subjects who were in college for the two-year period were referred to as the on-campus group(s), and the rest as the off-campus group(s).

Statistical comparisons of the scores of the on-campus and off-campus subjects were made for groups matched as to sex, intelligence, and who were similar on the initial measure of ethnocentrism, but were not specifically matched on ethnocentrism scores. The same statistical comparisons were made for all respondents without any matching having been done.

The comparisons that were made were for contrasting groups of males (on- and off-campus) and for females (on- and off-campus) for: (a) initial measures of ethnocentrism, (b) measures of ethnocentrism after two years, and (c) the change in ethnocentrism over two years for on-campus males, off-campus males, on-campus females and off-campus females.

Results and Conclusions

All comparisons that were made supported the hypotheses of this study. It was found that both on-campus males and females were significantly different in measured ethnocentrism after a two-year college experience from off-campus males and females who had not had a two-year college experience. It was further found that on-campus males and females changed significantly in ethnocentrism during the two-year period, and that off-campus males and females did not. All changes or differences for the on-campus populations were in the direction of decreasing acceptance of ethnocentric ideology.

With reference to the on-campus populations it was also found that:

1. Although females were significantly lower in the initial and terminal measure of ethnocentrism than were males, the amount of shift over time in ethnocentrism for females and males was the same.

2. Changes in ethnocentrism over time were not significantly related to intelligence for males, but were for females. The obtained coefficients were so small that it was concluded that modifications in ethnocentrism are not confined to those with high measured intellect.

3. Initial measures and terminal measures of ethnocentrism did not differentiate between fraternity and non-fraternity males or between sorority and non-sorority females.

60 pages. \$1.50. Mic 56-1937

FACTORS RELATED TO LOW ACHIEVEMENT IN HIGH SCHOOL ENGLISH

(Publication No. 16,837)

Elizabeth Lou Van Dalsem, Ed.D.
Stanford University, 1956

The purpose of this study was to identify academic and personal factors differentiating low-achievers and normal-achievers in secondary school English and to suggest where these data can be used in the schools to help students attain maximum educational growth.

The study was conducted in a northern California four-year high school. Sixty-five students in homogeneous sophomore English classes were selected for the study. This sample consisted of 31 normal-achievers and 34 low-achievers in English.

The general hypothesis of the study was that the low-achiever differs from the normal-achiever in certain identifiable variables other than academic aptitude or verbal intelligence. Differences on this latter variable were assumed to exist; the *t* test was applied to determine these differences.

Approximately 300 articles reporting educational research on these problems were examined. The literature on these matters presents three related educational problems which appear to be general and persistent: individual differences among students, teachers' conventional attitude toward the low-achiever and the normal-achiever, and the function and determination of homogeneous grouping as an aid to learning. Aspects of these three problems were investigated in this study to determine whether statistically significant differences existed in a particular sampling of two such groups and, if differences did exist, how they related to academic achievement in high school.

Six test instruments were selected on the basis of kinds of data required for the study and tests considered desirable for use by the school district in which the students in this study were enrolled. These instruments were the *Kuder Preference Record*, vocational interests; *Minnesota Multiphasic Personality Inventory*, personality factors; *Chicago Non-Verbal Examination*, non-verbal intelligence; *Iowa Test of Educational Development*, academic achievement; *American Council on Education Psychological Examination*, academic aptitude; and *American Council on Education Cooperative English Test*, English achievement. The students filled out questionnaires on personal and family history, and their vocational and educational aspirations. Parents responded to questionnaires on their plans for the academic and vocational careers of their children. Finally 25 teachers were interviewed to get their perceptions of students in their classes, both socially and academically.

The general hypothesis of the study was tested by examining several operational hypotheses. In treating the 21 factors statistically, the writer used the *t* test and chi square. There were statistically significant differences, at the .01 level, between the two groups favoring the normal achiever group on seven of the factors. These factors were one aptitude test, two achievement tests, one non-verbal intelligence test, teachers' perception of student attitude toward academic performance, academic training of fathers, and the educational aspirations of the student for himself.

The findings from this study neither support nor discourage homogeneous grouping in English classes at the high school level. The study has pointed up certain new factors which should be considered when such grouping is undertaken. The findings suggest that the attitudes of the teacher toward the pupil are not biased by the grouping procedure. The study further suggests that a complete analysis of differences among students must employ case study techniques in addition to the statistical analysis of test data.

157 pages. \$2.10. Mic 56-1938

EDUCATION, TEACHER TRAINING

THE CULTURAL SETTING OF THE PROBLEMS OF TEACHER TRAINING IN IRAN

(Publication No. 16,797)

Manuchehr Afzal, Ph.D.
Columbia University, 1956

This is a historical and comparative approach to the study of the problems of teacher training in their cultural setting in modern Iran. Teacher training as a focus of attention is viewed, firstly, in relation to the whole educational system, and, secondly, to the social, political, and economic conditions of Iran, as well as such international developments as the political imperialism and economic colonialism of the 19th century, and the rise of powerful ideologies like Fascism, Socialism, and Communism of the 20th century. In order to have a clear perspective of the problems of teacher training in the present day Iran, such problems are treated in the light of their historical background. To avoid lengthy discussions beyond the scope of this work, only those conditions that have brought about specific trends in the political and social behavior of the Iranians and, therefore, have entered into the making of an Iranian teacher, have been treated.

Modern Iran came into being as a result of the impact of the West upon the traditional society of Iran at the beginning of the 19th century. This impact was characterized by the influences of Western science and technology on the one hand, and Western political and economic imperialism on the other. The turning point in the history of modern Iran was the establishment of the constitutional regime in 1906. The aims of the constitutionalists, later better known as the nationalists, as reflected in the Fundamental Law of Iran and its supplement, was to check foreign politico-economic influences and to enforce internal reforms.

With the emergence of modern Iran a new system of education developed to serve modern needs of the country. The pattern of the development of this new system was the same as the growth of modern Iran and the problems of its teacher training were closely related to cultural complexities arising out of the interaction of the traditional society with Western culture. The most important characteristics of the modern system was its centralization in one Ministry with full authority, a manifestation the nationalists' aim to create a unified centralized Iran; its secularistic and nationalistic qualities, especially during Reza Shah's regime,

as a manifestation of the nationalists' aim to reform internal conditions and to check foreign influences.

In the social field modern education created a new class of intellectual bureaucrats which became the "elite" of modern Iran and replaced the old official class and to a certain extent the old academic class. Modern education in Iran became a vehicle to civil service - a position desired by all because it had combined social prestige and economic reward.

The problems confronting the teacher training institutions now are mainly those of curricular development and of recruitment. Modernization brought about social, political and economic changes affecting the traditional value system and moral standards. The result has been the creation of new social and personal problems, confusion in the minds of the youths, and conflicts among different groups. The curriculum, a copy of that in Western countries, is detached from the actual social and personal problems of the youths and is not suitable for a country in cultural transition. In order to save the culture from disintegration value reconstruction in the Iranian society and education for economic development are the main aims towards which the curriculum of teacher training institutions is to be geared.

From the point of view of recruitment capable candidates are difficult to recruit; and after recruitment most candidates leave primary teaching either to go to secondary teaching or to non-teaching jobs.

Education is influenced by and can also influence social, political, and economic conditions of the country. In a society in cultural transition like that of Iran, changes are bound to take place. But the change can be haphazard or planned. In any social and economic planning the expert advice of the educators can be employed to determine not only the direction of the change in terms of how best the integrity of the culture can be preserved but also what better methods can be adopted to give better results from the educational point of view.

365 pages. \$4.70. Mic 56-1939

EDUCATION, THEORY AND PRACTICE

SOCIAL RELATIONSHIPS OF AN ELEMENTARY CLASSROOM GROUP COVERING TWO SCHOOL YEARS

(Publication No. 16,835)

John Taylor Robinson, Ed.D.
Stanford University, 1956

Statement of the Problem

The problem pursued in this study was an analysis of the changes in social relations of a classroom group of third grade children under certain educational conditions. Educational conditions were designed to foster social relationships which included all children in the classroom. The educational conditions were described and the social relationships studied over a period of two school years.

Procedures Used

The procedures used included identifying the principles guiding the teacher's behavior and planning, and description of the ways these principles were implemented in curriculum practice. Therefore, the case study method was used since description of the total learning situation was required.

Sociometric choice and sociometric interviews were utilized in defining the social relationships and children's value statements regarding reasons for choice. Nine choice situations were used, spaced at intervals over the two year period.

Results

Within a period of four months, the group structure changed from one in which a few highly chosen individuals chose each other and the unchosen made choices only to the central persons to an inclusive structure in which all but four children enjoyed social choice. Over a period of a year, all children were included in the choice network.

The increase in the number and variety of reasons for choice which focused on social traits and skills paralleled the expansion of the network of choice. Such attributes as giving and receiving help, being kind, being friendly, and having good ideas came into prominence; skills in getting along with others, having good work habits, getting things done, and being dependable increased as reasons for choice.

Conclusions

The case study method prevents drawing conclusions which would have general application; the conclusions are

drawn as they relate to this classroom, this teacher, and this school setting. Similar studies with children under different educational conditions and from different social backgrounds need to be made before generalizations may be developed which have validity applied to any school setting.

The data support the following generalizations for this classroom group:

1. The extent to which all children in the classroom are included in the choice network is related to the values children place on behavior and social traits.
2. The social climate established in the classroom affects both the values children state and the interpersonal choices they make.
3. The total educational experience as usually defined by schools -- teacher behavior, content and methods -- interacting with the educative experiences in the peer group seemed to combine to develop an atmosphere of inclusiveness and support.
4. Children at the third grade level can become aware of their own and others' needs to belong, to feel wanted, to be accepted and feel competent when the teacher's behavior and methods emphasize these learnings.
5. Children's social choices are patterned and related, in this classroom, to their expectations of themselves and others.

Since the basic concepts with which life is interpreted are learned in primary groups, this study suggests that the primary group of the classroom can serve the human ends of personal acceptance and personal growth.

218 pages. \$2.85. Mic 56-1940

ENGINEERING

ENGINEERING, AGRICULTURAL

A STUDY OF THE TIME REQUIRED BY STUDENTS OF VOCATIONAL AGRICULTURE FOR PRACTICE TO DEVELOP BASIC SKILLS IN ARC WELDING

(Publication No. 16,751)

Adolphus James Miller, Ed.D.
Michigan State University, 1955

Purpose. - To determine for each of four basic skills in arc welding; (1) the time required for practice by students of vocational agriculture to develop each skill, (2) whether the means of groups of students, differentiated by age, by previous knowledge of arc welding, and by whether or not they began practice on the day of demonstration, differed significantly, (3) the extent of linear relationship between time used to demonstrate the skill and practice-time required to develop the skill.

Method. - The data of this study were obtained by use of an instrument containing instructions for making obser-

vations and providing space for recording results. In 1953 one hundred and ninety-five students, from the states of Illinois, Michigan, North Carolina, Ohio and Virginia were selected on the basis of criteria set forth in the instrument, were used to obtain the data.

Findings and interpretations. - For all students combined the means practice-time required (and their standard errors) to develop the skills making a bead, a fillet weld, a butt weld, and a fillet-weld lap joint were, 50.32 ± 5.49 minutes, 48.37 ± 5.47 minutes, 40.48 ± 3.92 minutes, and 35.33 ± 3.79 minutes, respectively. Means of practice-time of groups of students differentiated with respect to (1) age, (2) previous knowledge of arc welding, and (3) whether or not practice was begun on day of demonstration, did not differ at the five percent level of significance. When the mean number of days between the demonstration and the day the students begin practice is no greater than four it can be reasonably expected that the students will develop skills in arc welding as quickly as those who began practice the day the demonstration was given. Longer demonstrations by teachers did not insure reduction of time needed to develop the arc welding skills.

It is recommended that: (1) Class schedules be arranged and welding facilities provided that will allow each student approximately 175 minutes for practice and to begin practicing each skill within four days after it has been demonstrated. (2) Arc welding skills be taught to any age group enrolled in all-day or young farmer classes. (3) The method of collecting data be used to further determine the time required to develop skills in arc welding and other areas of farm mechanics.

141 pages. \$1.76. Mic 56-1941

ENGINEERING, CHEMICAL

MIXED 2-METHYL-NAPHTHOLS AS DYE INTERMEDIATES

(Publication No. 15,612)

Frank John Batug, Ph.D.
Purdue University, 1953

Major Professor: R. Norris Shreve

This comparative study of properties of dyes from a mixture of 2-methyl-naphthols versus beta-naphthol indicates that the former have the same yields, light fastness and, in most instances, a significantly darker color shade. The study covered 13 azo dyes of commercial significance having various chemical and use classifications. The study was undertaken to develop uses for 2-methylnaphthalene, a by-product of coal tar, which has recently become available commercially in a pure state.

The mixture of 2-methyl-naphthols was prepared by sulfonating 2-methylnaphthalene at 160°C. for four hours with 93 per cent sulfuric acid; subjecting the sulfonation product to caustic fusion at 300°C. for three hours. The mixture is believed to contain about 80 per cent 6-methyl-2-naphthol and the remainder consisting principally of the 2,1-isomer.

77 pages. \$1.00. Mic 56-1942

DIELECTRIC LOSS DISTRIBUTION IN DISPERSED TWO PHASE DIELECTRICS SUBJECTED TO A HIGH FREQUENCY ELECTRIC FIELD

(Publication No. 16,918)

Everett Keith McMahon, Ph.D.
Columbia University, 1954

The question of how dielectric losses are distributed between phases when a two phase, uniformly dispersed dielectric is subjected to a high frequency electric field has been studied experimentally.

A knowledge of the electric vector at every point in the system is necessary for an analytical solution to the problem. From a review of the problem of calculating dielectric constants of heterogeneous systems, the conclusion is made that an exact analytical solution is not possible.

The problem is treated as one of practical engineering

science; a study in theoretical physics is not attempted. Since the problem has not been previously studied, major effort was devoted to developing a satisfactory experimental method.

In this development, attempts were first made to measure loss distribution by means of unsteady state thermal measurements in systems actually heated by a high frequency electric field. The final method of measurement is based on measurements of power factor and dielectric constant of selected two-phase systems.

The following principles are utilized in the instrumental method. In a packed bed slurry of refractory granules within a fluid of known dielectric properties, if the dielectric constant of slurry and liquid are equal, the average dielectric constant of the solid is equal to that of the fluid. The principle was utilized in the measurement of dielectric constant of solid granules.

In a packed bed slurry of such granules, where the dielectric constant of solid and fluid are equal, the electric field is homogeneous. In such a system, the power factor of the assembly is given by a simple additive relation based on the power factor of each phase, and the partial volume of each phase. From measurements of power factor on liquid and slurry, the power factor of the solid granules is calculated.

In a series of geometrically identical slurries of a given solid, where the dielectric constant of the fluids in the series are equal, the electric field distribution is the same throughout the series. Therefore, the losses in the solid phase remain constant in the series. By plotting power factor of liquid vs. power factor of slurry, the losses in the two phases are obtained graphically.

The independent variables are considered to be phase geometry, frequency, ratio of dielectric constants, and ratio of power factors. Frequency was not studied; all measurements were made at 5 Mc. Precision of measurements is carefully considered and determined.

Chemical stability of liquids and solids is shown to be necessary; selecting stable liquids in sufficient variety for study is a serious experimental problem. Toluene, benzene, and the simple alcohols comprised the fluids. Solids included alumina, fluorspar, Alsimag, silica, and glass.

A Boonton type 160-A Q-meter was used for dielectric measurements. A special rhodium plated glass cell was used in which metal surfaces did not contact the test dielectric.

Important technical conclusions include the following.

Loss distribution in these systems is substantially independent of grain size. Previously published data of Schutz and McMahon is explained by variation in loss factor among the several sizes of alumina grains which they studied.

Data on losses in the dispersed phase is in agreement with the theory that the electric field is nearly homogeneous in the liquid-solid slurries studied.

Data on losses in the liquid phase are not easily correlated. The data suggests that the losses in the liquid phase are a unique function of the solid, all other factors being equal.

The Q-meter technique for measuring loss distribution is satisfactory and useful. It is capable of refinement.

A general correlation is not attempted with the data presented.

181 pages. \$2.40. Mic 56-1943

**A THERMODYNAMIC STUDY OF THE
SYSTEM BENZENE-PYRIDINE-WATER
(PARTS I AND II)**

(Publication No. 13,738)

Robert Earl Wagner, Ph.D.
Princeton University, 1955

The equilibrium still which was designed for the determination of vapor-liquid equilibria of partially miscible multicomponent systems consists essentially of vaporizers for generating the individual components in the desired rates, a mixing manifold, an equilibrium chamber in which the vapors are brought into equilibrium with the liquid phase, condensers and receivers, and a system for maintaining constant pressure during operation. Previously calibrated electrical heating coils are used on the vaporizers so that any predetermined constant vapor composition may be made to enter the equilibrium chamber. Provisions are made for the dry saturated vapor to make adequate contact with the liquid in the equilibrium chamber under conditions of negligible pressure drop and at any desired pressure within the strength of the apparatus. Means are provided for obtaining true equilibrium temperatures and samples. Adiabatic conditions are maintained throughout by use of electrical heating elements.

228 pages. \$2.95. Mic 56-1944

ENGINEERING, ELECTRICAL

**A NEW METHOD OF DRIVING-POINT
FUNCTION SYNTHESIS**

(Publication No. 15,614)

Wan Hee Kim, Ph.D.
University of Utah, 1956

Chairman: S. B. Hammond

A new method for synthesizing driving-point functions with passive, linear, bilateral elements in non-series-parallel structures is presented. The method is based on topological analysis and on the analysis of network poles and zeros.

By the new method, the driving-point functions which can be synthesized with a minimum number of elements are found, and the minimum number of reactive elements required to realize a minimum function is given. These results extend the relationship of the number of elements in a network realization to the order of the driving-point function. The synthesis method is reduced to solving simultaneous equations for the value of each element. The minimum function synthesis method is shown to be a modification of Pantell's process.

The topological properties of elementary products and S-functions^{20*} are reviewed and extended. The conditions to be satisfied for a given driving-point admittance function to be realized with a minimum number of elements are given in terms of the coefficients for second, third, and fourth order functions.

The linear transformation of the admittance matrix to reduce its rank with the objective of reducing the number of elements is studied. Several unsolved problems in the synthesis area are listed for future research.

63 pages. \$1.50. Mic 56-1945

* See thesis for bibliographical note.

**INVESTIGATION OF A TRAVELING-WAVE
TUBE WITH INTERCHANGEABLE EXTERNAL
SLOW-WAVE STRUCTURES**

(Publication No. 16,854)

Allen Randolph Matthews, Ph.D.
Stanford University, 1956

This report describes an investigation of a traveling-wave tube using an external slow-wave structure consisting of lumped circuit elements connected as conventional filters.

The tube design for maximum beam coupling is discussed along with the practical considerations for the use of lumped circuit elements as the slow-wave structure. Unusual mechanical problems associated with the tube construction are described, and practical limits of accuracy are shown to be consistent with the electrical requirements. Electron beam focusing by means of a uniform magnetic field and by periodic electrostatic focusing voltages is briefly examined theoretically and experimentally. The theoretical electrostatic focusing-voltage limits are verified experimentally.

The m-derived low-pass filter is examined theoretically and experimentally by means of cold tests on the circuit. The characteristic impedance, phase shift, attenuation, cut-off frequency, phase and group velocity, and effective magnitude of circuit elements are determined. Circuit terminations and impedance transformers are described. The circuit characteristics of the filter are extended for traveling-wave tube space-harmonic operation. The Brillouin diagram, space-harmonic phase and group velocities, space-harmonic voltage-tuning curves, impedance parameter K, and gain parameter C are derived.

Backward-wave oscillator experimental operation is presented and compared with the theoretical predictions. Experimental data on voltage-tuning curves, frequency pushing, start-oscillation beam current, gain parameter C_{-1} , impedance parameter K_{-1} , r-f power output, and electronic efficiency are presented. The data include curves as functions of frequency, circuit length, and other appropriate variables. Uniform magnetic beam focusing is used in most cases. BWO operation with periodic electrostatic beam focusing is presented and compared to operation with uniform magnetic-beam focusing.

Backward-wave and forward-wave-amplifier operation is briefly examined. Experimentally, data on gain and bandwidth are presented and compared with theoretical predictions.

Oscillograms are presented which illustrate each type of traveling-wave tube operation.

The external-circuit traveling-wave tube is a practical electron device. With a slow-wave structure three inches long and operating as a BWO, the tube generates over one watt of r-f power with an efficiency in excess of four per cent from 340 to 450 MC. The maximum power output obtained with a 60 ma beam current is five watts at an

efficiency of ten per cent. A tuning range from 80 to 457 MC was demonstrated on a longer circuit with one higher-order-mode interference from 248 to 257 MC that can be eliminated. Low r-f power output BWO operation with periodic electrostatic focusing does not influence normal BWO operation adversely.

The end of each major Section contains a brief summary of the Section details and emphasizes the most important information and figures.

Conclusions regarding the limitations and desirability of external slow-wave structures are presented, and recommendations for future investigations discussed.

173 pages. \$2.30. Mic 56-1946

ENGINEERING, INDUSTRIAL

THE BEHAVIOR OF WAGES AS AN INDUSTRIAL COST IN COUNTRIES UNDERGOING INDUSTRIAL DEVELOPMENT

(Publication No. 16,816)

Moshe Kelman, Ph.D.
Columbia University, 1956

This investigation was undertaken in an effort to improve the basis for economic design of manufacturing plants in unindustrialized countries.

The cost of labor is the largest cost element in industrial plant operation. Accordingly, variation in wage levels used for the selection of plant equipment has substantial effect on the kind of machinery to be used. Low wage estimates lead to lesser degrees of mechanization in design of operations than relatively high wage estimates.

The proper utilization of labor-machine cost relationships for design purposes, required a predictively useful regularity in the behavior of wages over time or as a function of a basic indicator of industrial development. In an attempt to discover such a regularity, wage series of five countries - Puerto Rico, Israel, U.S.S.R., India and the U.S.A. - were examined as a function of time, with no definite result.

In order to examine the behavior of wages as a function of the extent of industrial development, it was necessary to establish a measure of the degree of industrialization of a country. Six such measures were examined and the electric power production per capita was found to be the most useful category of all. This indicator of industrialization was correlated with the respective wage series in each of the countries under study. A strong correlation was found between these two factors in all five countries. These relationships were found to hold throughout wars, depressions and inflation. The existence of such a regularity was considered as an indication of the existence of a common and a stable causal system which may reasonably be expected to operate along the same lines as long as no major changes in the structure of the economy take place. On this basis the prediction of labor cost in a given country was made possible as a function of electric power production per capita.

Based on the above findings, a procedure was suggested

for the practical application of the relationships between wages and electric power production per capita. These relationships can be used to estimate the wage level to be applied in the selection among alternative equipment in industrial plant design. 251 pages. \$3.25. Mic 56-1947

ENGINEERING, METALLURGY

EFFECT OF LADLE ADDITIONS OF SOME ALLOYS AND ACTIVE METALS ON THE PROPERTIES AND MICROSTRUCTURE OF GRAY CAST IRON

(Publication No. 16,747)

Howard Leroy Womochel, Ph.D.
Michigan State University, 1954

A survey of the literature has revealed that silicon is regarded as the essential constituent of gray iron inoculants, that no satisfactory theory for the inoculation mechanism has been proposed, and that comparative data on the relative effectiveness of the various commercial inoculants are lacking. Accordingly a general investigation has been undertaken in which commercial inoculants and the elements occurring in these alloys have been compared as to their effectiveness as a step in the direction of formulating a theory and of providing data of practical value regarding the most effective inoculating procedure.

Irons for this investigation were melted in an indirect arc, 200 lb furnace. Comparisons were made of the mechanical properties, chilling tendencies, and microstructures of irons treated with various inoculants to the same final compositions.

This investigation has indicated that the element silicon is not effective as an inoculant. Data has been acquired which shows that the inoculating power of alloys increases with the aluminum and calcium contents. It has been shown that aluminum is particularly effective in reducing chilling tendency, and that calcium is effective both in decreasing chilling tendency and improving graphite distribution and the mechanical properties of high strength gray iron.

The most effective of the commercial inoculants has been established as calcium-silicon. The advisability of using larger quantities of the inoculating alloys than is generally recommended is demonstrated.

Observations have been made which indicate that calcium forms a carbide in molten iron. The literature has disclosed that calcium is unique among the elements found in inoculating alloys in two respects: 1) its free energy of oxide formation under standard conditions is the lowest of the several elements and 2) its carbide has a structure believed by chemists to be different from that of other active metal carbides. The possibility of formulating theories on the basis of deoxidation and of carbide formation is discussed.

Specific conclusions and observations from this report are:

1. The element silicon is not effective as an inoculating agent.
2. Silico manganese, which is relatively free of calcium and aluminum, is not effective as an inoculant.

3. The inoculating ability of various commercial grades of ferro-silicon increases with the calcium and aluminum contents. Low calcium grades have very little effect.

4. Silicon-manganese-zirconium alloys containing somewhat more calcium than is found in commercial ferro-silicon are more effective than ferro-silicon.

5. The most effective inoculant employed in these experiments is the calcium-silicon alloy with approximately 30% of calcium.

6. Although aluminum is a very powerful chill reducer, its addition to cast iron does not promote type A graphite distribution.

7. Metallic calcium additions to the ladle bring about marked improvements in properties and graphite distribution of cast iron. Calcium is superior to all other inoculating agents tested in these experiments, with the exception of calcium-silicon, when added in the amount of approximately .4%.

8. Metallic calcium is effective in reducing the chilling tendency of cast iron. 118 pages. \$1.50. Mic 56-1948

ENGINEERING, SANITARY AND MUNICIPAL

A STUDY OF SOME LIPID COMPONENTS PRESENT IN ANAEROBICALLY DIGESTING SEWAGE SOLIDS

(Publication No. 16,684)

Peter Klaus Mueller, Ph.D.
Rutgers University, 1955

The main purpose of this study is to characterize some of the changes of the major lipid constituents present in anaerobically digesting sewage sludge, and to interpret the observed changes in terms of biochemical theory in order to further the knowledge about the mechanism of anaerobic digestion.

The sludges were analyzed for pH, total and volatile solids, and gas production. The lipids were extracted from acidified, chemically dried sludge samples with petroleum ether. These lipids were fractionated into acid free greases and free fatty acids using solvent extraction. The acid free greases were saponified and the unsaponifiable matter and the fatty acids from esters were quantitatively recovered.

The free and ester fatty acids were each fractionated into total and individual saturated and unsaturated fatty acids. The unsaturated fatty acids were determined using iodine numbers and ultraviolet spectroscopy after conjugation. The unsaturated fatty acids were removed from the saturated fatty acids by performic acid oxidation followed by solvent extraction. The saturated acids were fractionated into lauric, myristic, palmitic and stearic acids using reversed phase partition chromatography. In this method unwettable Hyflo Super Cel is the adsorbent, cyclohexane is the stationary phase, and aqueous methanol is the mobile phase. All the methods employed are evaluated and described in detail. These methods were applied to the study of two unseeded, two seeded and two continuous high rate digestions. The high rate of digestion was achieved by frequent feedings of concentrated sludge and continuous stirring.

The results show that fats are hydrolyzed to free higher fatty acids containing 80 to 90% oleic, palmitic and stearic acids. Within the first 20 days of unseeded digestion the unsaturated acids are hydrogenated to saturated fatty acids. Before conditions become optimum for maximum methane production the palmitic acid concentration increases while the stearic acid concentration decreases. When conditions are optimum for methane production the fatty acids are degraded to volatile acids and methane and carbon dioxide without significant accumulation of intermediate fatty acids other than myristic acid. During the period of maximum methane production 70 to 80% of the total lipid destruction occurs. Oleic, palmitic and stearic acid disappear at about the same rate during this time. Towards the end of digestion the ester fatty acids and the percent of unsaturated fatty acids increase. The results from the high rate digestion experiments show that greater percentage reduction in volatile matter and lipids takes place with greater loadings up to at least 1.0 lb volatile matter/cu.ft. of digestion/day. While unsaponifiable matter is not destroyed during the seeded digestions, during the high rate digestion unsaponifiable matter undergoes 20 to 40% destruction.

The general conclusions are that:

(1) The iodine numbers of sludge fats may be a useful parameter for measuring the degree of digestion.

(2) The dispersion of lipids and contact with the organisms involved is the most important rate limiting factor in the anaerobic destruction of sewage solids up to loadings of 1.0 lb/volatile matter/cu.ft. of digester/day.

(3) The results fit with the theory of β -oxidation of fatty acids.

235 pages. \$3.05. Mic 56-1949

FINE ARTS

PREHISTORIC STONE SCULPTURE OF THE WESTERN UNITED STATES

(Publication No. 16,899)

John Crozier Galloway, Ph.D.
Columbia University, 1956

The aboriginal peoples of the western United States created, between the fourth century A. D. and the period of extensive European settlement, a stone art notable for its vigor of concept and range of subjects. Figurines of human and animal forms, sculptured heads, and decorated vessels and tools were executed in a variety of stones ranging from such soft material as steatite to the tougher kinds of granite. The techniques most often applied were pecking, crumbling, grinding, and direct carving with stone blades.

The Hohokam and Puebloan cultures of Arizona and New Mexico, the early Chumash of California, and the predecessors of the Salish and other historic Indian groups of the Northwest were the producers of this art. The motivation of these early sculptures appears in many cases to have been ceremonial or ritualistic. In other instances, the prestige value accompanying connoisseurship may have impelled artistic effort.

These aboriginal carvings comprise an important North American art form. They are, however, relatively little known either popularly or in archaeological or art historical literature. Such works may be seen in a number of United States museums of natural history and in private or historical society collections. Usually they are not displayed as works of art but as "artifacts" or "material culture objects."

Certain analogies may be traced between selected examples of this sculpture and works from archaeological areas elsewhere in the Americas and in the Pacific. But the styles of western United States stone art are definitive and do not appear to derive basically from outside sources.

The major tradition in the Southwest is a round-sculpture interpretation of animal subjects, many of which are believed to have served as power figures at rituals. These objects are usually seven inches or less in length, although certain of them are as long as eighteen inches. A second classification comprises flat carvings of deities in human form.

On the California coast and in the Channel Islands, marine subjects and incised, inlaid vessels and pendants were principal objects in stone art. A strongly volumar style accompanied by capably finished surfaces is typical. Most Chumash carvings are of funerary provenience, and a ritualistic meaning seems probable in such instances.

A vigorous, diversified interpretation of animal and human themes in the form of figurines, utensils, and carved heads is characteristic of the Columbia River Valley, the Oregon-Washington coast, and southern British Columbia. In much stone sculpture of the Northwest, a massiveness of form, resulting partly from the widespread technique of pounding or pecking in this area, is one of the striking stylistic aspects. This region is outstanding both quantitatively and aesthetically.

Throughout the early western United States the dominant sculptural tradition is one in which strongly formed volumes and suppressed details take precedence over elaborate surface design. A number of excellent works belong, however, to an essentially decorative classification which occurs in each of the three sub-areas. Reduced, sometimes ideationally formed images are more frequently encountered than are painstakingly articulated visual representations.

Style-centers existed at Snaketown and Casa Grande, Arizona and at Zuni Pueblo, New Mexico, in the Southwest; at several coastal and insular sites of central and southern California; and at some twenty localities in the Northwest.

The prehistoric sculptors of the western United States achieved an aesthetic expression of enduring quality.

496 pages. \$6.30. Mic 56-1950

GEOGRAPHY

A STUDY OF SOIL EROSION AND SOIL CONSERVATION IN MUSKINGUM COUNTY, OHIO

(Publication No. 16,638)

Chi-Kang Hsu, Ph.D.
University of Maryland, 1955

Supervisor: Professor Clayton E. Whipple

This dissertation deals with soil erosion and soil conservation in Muskingum county, Ohio. The area is part of

the Unglaciaded Allegheny Plateau, a rather large and clearly defined physiographic region in the Eastern United States. From the geographical point of view, a study of Muskingum county not only helps understand this county alone, but also may throw some light on the situation of the whole Unglaciaded Allegheny Plateau because of the similar human and physical conditions throughout the region.

Soil erosion has become a serious land problem in Muskingum county. Three types of erosion, namely, sheet erosion, gully erosion, and slip erosion, have occurred in the county. While gully erosion and slip erosion are of

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The items following each abstract are: the number of manuscript pages in the dissertation, its cost on microfilm, and the Library of Congress card number. Enlargements 5-1/2 x 8-1/2 inches, 10 cents per page. No postage is charged if check or money order accompanies order.

local importance, sheet erosion is widespread, occurring all over the area. In fact, all the lands in Muskingum county, except for the limited flat valley bottoms, have been eroded to some degree. In many places, one quarter to three-fourths of the original topsoil has been lost. In addition to the loss of soils on uplands, other problems, such as floods and the destruction of the lowlands, arose in conjunction with erosion.

The serious soil erosion in Muskingum county is due to both physical and human causes. On the physical side, the dominant hilly topography, frequent occurrence of excessive rains, shallow and poor upland soils, and the insufficient natural vegetative cover all have something to do with erosion. Human causes contributing to accelerated soil erosion in Muskingum county are improper farming methods and mistreatment of the land. The former includes "square farming", plowing up and down the hill, unsound crop rotation, and the lack of cover cropping. The latter refers to the cultivation of too steep slopes, woodland grazing, untimely use of pastures, and little improvement of both permanent pasture and wooded lands.

Soil Conservation work in Muskingum county started in the early thirties, but county-wide soil conservation work did not exist until after the establishment of the Muskingum County Soil Conservation District in 1944. Through close cooperation with the United States Soil Conservation Service, this District has been responsible for carrying on soil conservation work in the county. Its duty includes land classification, farm planning, application of conservation measures, and a certain amount of educational activities.

Formal soil conservation work in Muskingum county has a history of about ten years. Already conspicuous effects are shown on lands where conservation measures have been adopted, including greater farm production and income, better land protection, new landscapes, and people's favorable attitude toward conservation farming. All these indicate strongly the trends of changes for the entire county in the near future.

However, there are some pending problems in connection with the work of advancement of conservation farming. They are the economic capability of the farmer, his full understanding of the significance of conservation, good land tenure system, sufficient supply of technicians, etc. The future development of soil conservation work in Muskingum county will depend upon the degree of success of the solution of these problems.

221 pages. \$2.76. Mic 56-1951

LAND DIVISION IN CENTRAL CHILE

(Publication No. 15,058)

Gene Ellis Martin, Ph.D.
Syracuse University, 1955

This paper is a study of the processes of land division and the effect of these processes on land utilization, land

tenure and settlement in rural central Chile. The objective is to contribute basic knowledge to the understanding of land division in Chile.

Four types of land division were recognized in the area chosen for detailed study: 1) government sponsored land subdivision, 2) privately sponsored land parcelation schemes, 3) division of land as a result of inheritance, and 4) the creation of small properties by selling individual parcels.

Sixty percent of the total cultivable irrigated land of the study area has been subdivided in the last twenty-five years. Ten percent has undergone government subdivision, eight percent private parcelation and thirty-eight percent division by inheritance. The number of properties increased from sixty-seven in 1928 to 330 by 1954. In 1928 only four percent of the total cultivable irrigated land was in farms of less than one hundred hectares. By 1954 thirty-five percent was in farms of less than one hundred hectares and fourteen percent was in farms of less than twenty-five hectares.

Land division has had a profound effect on land utilization, land tenure and settlement in central Chile. The detailed analysis of the effects of the land division processes on a small segment of the longitudinal valley of central Chile has shown that there has been an increase in land use intensity where land division has taken place. The traditional extensive alfalfa-small grain type of land use associated with large holdings has been replaced by more intensive uses such as orchards, vineyards and poultry farms on the smaller properties.

As the subdivision of land, either under government or private auspices was not accompanied by any program for the settlement of agricultural workers, there has been no improvement in the living standards of the rural inhabitants. On the contrary, the traditional labor system of the large properties has proved to be inadequate on the smaller properties and the passing of this system has made for considerable labor dissatisfaction.

The new owners, mainly middle class urbanites, have frequently been unable to make the small properties self-supporting. They have attempted, with only a small land base, to duplicate the manner of living of the landholding aristocracy. Consequently there has been frequent ownership changes of the small properties and a continuation of the pattern of absentee ownership.

Settlement patterns associated with the large properties have been modified due to functional changes in farm operation on the subdivided land. The uniform linear settlement pattern has been replaced by a dispersed pattern. The typical landscape of central Chile, one of large fields lined by Lombardy poplars and eucalyptus, has disappeared on subdivided land.

Population density is greater where subdivision has occurred. Within the study area population density per square kilometer of cultivable irrigated land is about sixty on the large undivided properties and around one hundred on the small properties.

182 pages. \$2.40. Mic 56-1952

GEOLOGY

MARINE TERRACES AND SEDIMENTATION IN THE SANTA CRUZ AREA, CALIFORNIA

(Publication No. 16,838)

William Crane Bradley, Ph.D.
Stanford University, 1956

The sea floor in the vicinity of Santa Cruz, California, is a modern wave-cut platform eroded into the Miocene Monterey formation. The surface of the platform truncates all Monterey structures but retains two to four feet of relief as a result of differential erosion. The platform slopes seaward at an angle of less than one degree and is slightly concave upward, the concavity being greatest within half a mile of the sea cliff. In places the platform is bare, but elsewhere it is mantled by a veneer of sand which is generally less than four feet thick. This sand is for the most part finer-grained than beach sand and tends to decrease in grain size seaward.

Four prominent marine terraces are present in the vicinity of Santa Cruz. The lowest of the terraces, herein called the 100-foot terrace, consists of a sediment-veneered wave-cut platform. The platform surface truncates all Monterey structures, it slopes seaward at an angle of less than one degree, and it is slightly concave upward, the concavity being greatest within half a mile of the old sea cliff. A sheet of marine deposits, commonly 5-15 feet thick, mantles the platform. These deposits are laminated and in places include black sands. They are as coarse-grained as modern beach deposits.

The similarity between the modern wave-cut platform and the old platform of the 100-foot marine terrace suggests that the two were formed in the same manner. The dissimilarity between the modern platform deposits and the marine terrace deposits suggests that the latter are not the original neritic deposits that existed when the platform was under water. The terrace deposits resemble modern beach deposits in thickness, laminated structure, and grain size. Rock-boring mollusks in the old platform, now buried by the terrace deposits, suggest that the deposits were laid down after the platform was cut. Pyroxene, sphene, and shells have been leached to a progressively greater extent from the terrace deposits back toward the old sea cliff. This suggests that the deposits are oldest next to the old cliff, and that they are progressively younger toward their distal portions. The marine terrace deposits are herein interpreted as beach deposits which were prograded seaward across the platform during a period of slow emergence.

The terrace sands consist of two readily identifiable fractions. The first is similar to modern beach sand in that the grain size exceeds 0.180 millimeters and there is little contained mica. The other similar to modern neritic deposits in that the grain size is less than 0.180 millimeters and there is abundant contained mica. The coarser-grained mica-poor sand is interpreted as material that was carried to the sea by streams and distributed along the

prograding beach by normal littoral processes. The finer-grained mica-rich sand is interpreted as former neritic material that was reworked into the prograding beach as sea level fell.

Etched pyroxene grains from the terrace deposits are mechanically unstable in the surf zone and their sharp points become rounded. These etched grains are rare, therefore, in beaches and in surf zone deposits. Such grains occur in significant numbers, however, in neritic deposits beyond the surf zone, where the water is deeper than about 30 feet. This suggests that the neritic deposits beyond the surf zone are suffering little abrasion, and therefore are not abrading the modern platform to any important extent. Because the modern platform and the 100-foot platform are much wider than the surf zone, it is concluded that both platforms were eroded during periods of slow submergence. 125 pages. \$1.70. Mic 56-1953

GEOLOGY AND MINERAL DEPOSITS OF THE AIKEN LAKE MAP-AREA, BRITISH COLUMBIA

(Publication No. 11,010)

Ernest Frederick Roots, Ph.D.
Princeton University, 1949

Aiken Lake map-area, comprising 2,640 square miles in the Omineca Mountains of north-central British Columbia, is underlain by consolidated formations ranging in age from Proterozoic to Tertiary, including a great variety of sedimentary, volcanic, intrusive, and metamorphic types.

The Proterozoic and Early Cambrian rocks have been regionally metamorphosed under conditions that have resulted in a uniform increase of metamorphic grade with successively lower stratigraphic horizons, and that have produced a schistosity parallel with the major bedding structures. Within a restricted area, whose outlines are independent of the general fold structures and the stratigraphy, these rocks have been further metamorphosed and granitized, and intruded by granitic masses, to produce a metasedimentary-igneous complex.

Ultramafic intrusive bodies include a large, steep-walled, flat-roofed stock composed mainly of serpentinized peridotite rich in monoclinic pyroxene. The roof rocks are still in place over parts of this stock, and the general relations suggest that the stock cannot, in its present position, be a differentiate of a less mafic magma, but must have been intruded as ultramafic material. The stock has produced a distinctive contact metamorphism in the surrounding rocks, of which the most widespread has been the development of pseudodiorite, hornblende-feldspar hybrid rock, and hornblendite, at the contact with andesitic rocks.

The Omineca intrusions of Late Jurassic or Early Cretaceous age include a melanocratic, quartz-free series of rocks, ranging from biotite-peridotite and hornblendite to

diorite, and a leucocratic, mainly quartz-bearing series, of which the dominant varieties are quartz diorite, granodiorite, and adamellite-granite. Study of the structural relations of these bodies suggests that the final advance of the exposed parts of the Omineca intrusions was through stoping and forcing aside the country rock, after the regional stresses producing the folding in the country rocks had been dissipated.

The major structures in the area are dominated by the belt of strong rocks within and about the Omineca intrusions, and the parallel, weak, mobile, Rocky Mountain Trench, which is characterized by probably steeply-dipping faults of large vertical displacement. Between these two features, the rocks have been deformed into northwest-trending folded belts, crossed by transverse tear faults and separated by longitudinal faults whose displacement has been mainly down the dip.

Lode mineralization is of three main types:

- (a) deposits of the silver-lead-zinc type in the Proterozoic and Early Cambrian rocks, and in the Late Palaeozoic limestones, remote from exposed major intrusive bodies;
- (b) gold, gold-copper, or copper-lead deposits within or near and apparently related to the Omineca intrusions;
- (c) cinnabar deposits formed later than post-Paleocene faulting.

714 pages. \$9.05. Mic 56-1954

PHYSICAL STRATIGRAPHY OF THE PHOSPHORIA FORMATION IN NORTHWESTERN WYOMING

(Publication No. 16,859)

Richard Porter Sheldon, Ph.D.
Stanford University, 1956

The rocks of the Phosphoria formation in northwestern Wyoming fall into five stratigraphic units, which, from oldest to youngest, are provisionally called the A, B, C, D, and E units. Units A, C, and E are composed dominantly of chert, carbonate rock, and sandstone, whereas units B and D are composed dominantly of mudstone, phosphorite, and dark carbonate rock. Units C and D are continuous over all of northwestern Wyoming, whereas unit A grades into unit B and unit E grades into unit D to the southwest. Both units A and B pinch out to the north. With the possible exception of unit A, these units can be recognized in southwestern Montana. Units B, C, and D are equivalent to the phosphatic shale, Rex, and upper shale members of the Phosphoria formation in southeastern Idaho. The formation as a whole exhibits a facies change from dominantly chert, mudstone, and phosphorite in the southwest of northwestern Wyoming to dominantly carbonate rock and sandstone to the northeast. The facies change by both thinning and pinching out of units and the intergradation of units.

The rocks of the formation in the area of the report are cyclically deposited. The rock record of a single ideal cycle consists of, from base to top, carbonate rock, chert, phosphorite, chert, and carbonate rock. Sandstone and glauconite in general are found in the carbonate phase of the cycle, whereas mudstone, pyrite, and organic matter are found in the chert and phosphorite phases of the cycle. An eastward facies transition from phosphorite to chert

and chert to carbonate rock is analogous to the upper half of the cycle, i.e., phosphorite, chert, and carbonate rock in ascending order. The phosphorite phase of the cycle is represented by units B and D, whereas the other phases are represented by units A, C, and E. Two complete cycles are found in southwestern Wyoming.

These stratigraphic relations represent two transgressions and regressions of areally zoned environments. The phosphorite phase is the most transgressive whereas the carbonate rock phase is the most regressive. The physical chemical environments in which the sediments accumulated probably varied between an environment with a pH of above 7.8 and an Eh of greater than zero for the carbonate rock phase of the cycle and an environment with a pH of less than 7.8 and an Eh of less than about -0.25 for the phosphorite phase of the cycle. These environments probably were effected by cold water upwelling on a shelf to the east. The transgressive and regressive migrations of the shelf probably were tectonically controlled.

170 pages. \$2.25. Mic 56-1955

EVOLUTION AND HISTORY OF THE WHITEHORSE TROUGH AS ILLUSTRATED BY THE GEOLOGY OF WHITEHORSE MAP-AREA, YUKON

(Publication No. 16,828)

John Oliver Wheeler, Ph.D.
Columbia University, 1956

The Whitehorse trough, which received sediments from late Triassic to early Cretaceous, extended southeast from Carmacks, Yukon through the northeastern and central parts of Whitehorse map-area into northwestern British Columbia.

The southwest part of Whitehorse map-area contains a northwest-trending belt of late Paleozoic or, in part, possibly Precambrian, predominantly quartzose metamorphic rocks. They are isolated within granitic rocks. Similar rocks occur in the extreme northeast corner of the map-area.

The southeast corner of the map-area has Permian and, possibly in part, Pennsylvanian, mainly non-clastic sedimentary and volcanic rocks faulted against Mesozoic rocks.

The rest of the map-area is underlain chiefly by Mesozoic rocks, deformed, for the most part, into northwest-trending folds. They comprise Upper Triassic volcanic and marine sedimentary rocks, both poor in quartz, which are overlain, in places disconformably, by Jurassic marine and partly non-marine, locally coarse sedimentary rocks containing abundant granitic debris. Upper Jurassic (?) and Lower Cretaceous non-marine, coal-bearing, quartzose sedimentary rocks are faulted against other Mesozoic rocks, but in areas to the north lie conformably on Jurassic rocks.

Gently deformed and flat-lying mid-Cretaceous and Tertiary volcanic rocks overlie the folded and faulted Mesozoic rocks with angular unconformity.

Intrusive rocks are principally ultramafic and granitic. Ultramafic rocks apparently intrude highly deformed rocks as young as Jurassic. A granitic intrusive complex, forming the northern extension of the Coast intrusions, underlies

much of the southwest half of the map-area. Elsewhere granitic plutons cut folded Mesozoic formations and mid-Cretaceous volcanic rocks. Tertiary granite porphyry plugs and dikes of rhyolite and basalt are the latest intrusions.

A study of the geology of Whitehorse map-area and of the literature of the surrounding region suggests that the following succession of events took place in the Mesozoic.

The relatively quiet tectonic environment in the Permian in the central part of the eugeosynclinal belt of the northwestern Cordillera was succeeded in late Triassic by a period of tectonic activity. In late Triassic the Whitehorse trough lay east of a volcanic arc probably extending along the axis of the Coast Mountains and possibly accompanied by a nonvolcanic arc perhaps 100 miles to the west. In early Jurassic parts of the volcanic arc were spasmodically uplifted and coarse sediments poured into the trough on the side facing the craton. Granitic rocks, whether from an older mass, perhaps correlative with pre-Permian granitic rocks in the Atlin map-area, or an intrusive body, were brought into contact with volcanic rocks of the inner arc just prior to or during this uplift. Some sediments, including granitic material, were derived from the northeast side of the trough. In late Jurassic and early Cretaceous the northern part of the trough was probably non-marine. The sediments in the trough may have overlapped the earlier Jurassic sediments along the margins of the trough and probably were derived from quartz- and chert-rich source areas farther from the axis of the trough than earlier in the Jurassic. The rate of uplift of the source areas and the rate of subsidence of the trough appear to have decreased by early Cretaceous. The trough was then deformed in mid-Cretaceous.

The Whitehorse trough has characteristics in common with idiogeosynclines of the East Indies, with western Californian geosynclines younger than the Nevadan orogeny, and with epieugeosynclines.

Ultramafic rocks in this part of the eugeosynclinal belt do not lie within restricted zones, but appear to have been intruded into volcanic arcs and on both sides of them at times when deformation was sufficiently intense.

Granitic rocks have been unroofed at several times during history of this part of the eugeosynclinal belt. The largest areas of granitic rocks are those flanking the Whitehorse trough where such rocks existed previously. Granitic plutons were intruded into the trough after it had been deformed and overlain by an assemblage of volcanic rocks.

194 pages. \$2.55. Mic 56-1956

THE CAMBRIAN AND DEVONIAN CARBONATE ROCKS AT YAMPAI CLIFFS, MOHAVE COUNTY, ARIZONA

(Publication No. 16,756)

William Hulbert Wood, Ph.D.
University of Arizona, 1956

The Muav limestone (Cambrian), the Supra-Muav sequence (Cambrian) and the Devonian sequence have a combined thickness of 2500 feet at South Grand Wash Cliffs, Arizona. At Juniper Mesa, approximately 90 miles to the southeast, the combined thickness is 380 feet. At Yampai Cliffs, located midway between these two areas, a field study was made to determine the causes of the thinning of each of the three units.

McKee's classification (1945) of the Muav limestone is adapted to this area by defining a new unit, the Yampai Cliffs member. This member comprises all deposits of the Muav limestone above the Kanab Canyon member. It is divided into three submembers A, B, and C. The surface of erosion at the top of Submember A displays a relief of more than 40 feet; it may extend to greater stratigraphic depth in a southeasterly direction. This would help to account for the thinning of the Muav section from Yampai Cliffs to Cross Mountain.

The Rampart Cave member of McKee (1945) is divided locally into three submembers. The upper and lower submembers represent episodes of marine transgression; the middle submember represents an episode of marine regression.

The overall thickness of the Muav sections at Diamond Creek and at Yampai Cliffs is approximately the same, but every member of the Muav shows some kind of evidence of shoreward facies change in a southerly direction.

The Supra-Muav sequence becomes more clastic in a southeasterly direction from Yampai Cliffs to Cross Mountain. At Cross Mountain its basal beds consist of several feet of coarse-grained, cross-bedded quartzitic sandstone containing quartz pebbles. This fact suggests post-Muav erosion of nearby Tapeats or pre-Cambrian terrain.

The Fort Rock (Cross Mountain) section of McNair (1951) is revised by assigning to the Supra-Muav the lower 61-1/2 feet of sediment that he assigned to the Devonian, and by assigning all of McNair's "undifferentiated dolomitic limestones" to the Muav limestone.

The Supra-Muav sequence and the Devonian sequence show similar preferred associations between colors of fresh and of weathered surfaces, whereas the preferred associations in Yampai Cliffs, Submember C, are somewhat different.

The Devonian sequence at Yampai Cliffs consists entirely of cyclothems, each of which is comprised of one or more of six broadly defined lithologic types (phases).

Areas within the Grand Canyon region that were tectonically more negative during Tapeats-Bright Angel time tended to be more negative during most of Muav time. The interruption of this pattern during Gateway Canyon time is attributed to a small and short-lived zeugogeosyncline.

321 pages. \$4.01. Mic 56-1957

HISTORY

HISTORY, GENERAL

THE POLITICAL VIEWS OF THE EIGHTEENTH CENTURY NEW ENGLAND CLERGY AS EXPRESSED IN THEIR ELECTION SERMONS

(Publication No. 16,894)

Martha Louise Counts, Ph.D.
Columbia University, 1956

Nearly every year during the eighteenth century the Massachusetts General Court and the Connecticut General Assembly invited a minister to preach a sermon to them on the first day that they convened. This practice, which had its roots in the seventeenth century, lasted well into the nineteenth century and the discourse is known as the election sermon. Both Vermont and New Hampshire adopted the custom of the election sermon during the latter part of the eighteenth century. In these sermons the ministers treated political subjects. They frequently discussed the role of God in men's affairs, the nature of man, the origin and purposes of government, the ruler's qualifications, limitations and functions, and the role of the people. The election sermons, therefore, are an excellent source for the historian who is interested in the political thinking of the New England clergy.

This study traces the changes in the New England clergy's political philosophy as revealed in the eighteenth century election sermons. The most significant shift involved the clergy's concept of the role of the people. The way in which they viewed the people influenced their entire thinking on government. During the early years of the century the clergy expressed little faith in the people. Even though the ministers repudiated the doctrine of nonresistance and passive obedience, they remained skeptical about the masses' ability to ascertain when they were genuinely oppressed. The clergy preferred that the elite of society make decisions in such delicate political matters. The people should continue to obey their rulers as long as the latter did not demand that they go counter to God's laws.

As the difficulties between Great Britain and her American colonies became more acute during the years following the French and Indian War, the clergy more and more adopted the terminology of the social compact and natural rights school of thought. The Massachusetts and Vermont ministers proclaimed that all men were born free and equal, that the people had a right to throw off the tyrant's yoke, that the people limited the ruler in his authority, and that the people had certain inalienable rights which the ruler could never infringe. The Connecticut preachers' views differed from their colleagues. They hesitated to trust the people's judgment and to consider all men equal.

Following the Revolution the clergy feared that the American people would abuse their power. Although the ministers did not deny that the people were the source of all power, they tried to restrict the way in which they

should use this power. They cautioned the populace against confusing license with liberty and argued that inferiors should listen to their superiors. They also advocated the diffusion of Christian morality throughout the body politic. The clergy were no longer as intent as they had been in the beginning of the century to make sure that the state supported one particular religious sect; rather they emphasized the need for the ruler to instill Christian values into the people. Such values were the only sure basis upon which a free and stable society could rest.

Throughout the century the New England clergyman spoke out freely on every phase of human life. He considered it imperative that the magistrate watch over the religious, moral, economic, social and political life of the people. It was the duty of the minister of the gospel to help him. Both were God's ministers: one in the secular sphere, the other in the spiritual. Together they would guide the people. As the years passed the preacher emphasized the point that God's laws should be followed on this earth because they were best suited to secure the happiness of the people in this world as well as in the next.

290 pages. \$3.75. Mic 56-1958

HISTORY, MODERN

ERA OF THE PROTOCOL; A CHAPTER IN THE HISTORY OF THE INTERNATIONAL LADIES' GARMENT WORKERS' UNION, 1910-1916

(Publication No. 16,889)

Hyman Berman, Ph.D.
Columbia University, 1956

This study traces the organization of the labor force of the ladies' garment industry into effective and stable trade unions during the early decades of the twentieth century and then examines the workings of a pioneering trade agreement, known as the Protocol, which was in effect in many branches of the industry from 1910 to 1916.

The first two chapters give the reader an economic birdseye view of the industry and relate the faltering attempts of the Union to organize the labor force from 1900 to 1910. Chapters III - V, dealing with the Waistmakers' Strike of 1909, the Cloakmakers' Strike of 1910 and the strikes in the women's trades in 1913, relate the successful efforts at trade union organization. Union and manufacturer tactics are explored and the role of the socially conscious outsiders, such as Brandeis, Filene, Marshall, Schiff, etc., is examined. Without the interference of the social workers and progressives it is doubtful whether trade union organization would have been successful as early as 1910 in the ladies' garment industry.

The meaning of the trade agreement or Protocol entered into by the Association of cloak manufacturers and the Joint Board of Cloakmakers' Unions in New York is explained in Chapter VI. This agreement, an outgrowth of Brandeis' attempts to settle the bitter Cloakmakers' Strike of 1910, was of perpetual duration; established the preferential union shop; recognized that the public had an interest in preserving industrial peace; created joint labor-management boards to mediate disputes and to regulate industrial sanitary and health standards; and outlawed strikes and lockouts in the industry. The founders of Protocolism believed that mediation through a Board of Grievances, rather than arbitration by an outside third party, would successfully prevent the recurrence of the industrial strife which marked the ladies' garment industry prior to the introduction of the Protocol.

When the trade agreement was extended to some other branches of the industry, new Protocol agencies were established. These new bodies were designed to foster efficiency, scientific management, and uniform standards throughout the industry through joint labor-management efforts.

The workings of the Protocols in the cloak, dress and ladies' tailors branches of the industry is examined in Chapters VII - IX. The difficulties in educating the largely immigrant and class conscious labor force to the advantages of protocolism and the inability of many Association manufacturers to recognize that organized labor had an equal stake in the industry's efficient operation, tended to destroy the pioneering efforts of protocolism.

Internal Union and Association conflicts, reflecting opposing trade union and management philosophies, brought the difficulties to a head. The Union leadership was largely composed of Marxists who had been slowly converted to pragmatic unionism by experience. The bulk of the rank and file, however, still believed that the conflict between capital and labor was irreconcilable. It was, therefore, not surprising that when the more radical Union leaders attacked the Protocols as class collaborationist and demanded more militant action to prevent unfair discharge of active union members, many of the rank and filers followed these extremists.

Despite the settlement of the internal conflicts in 1914 through the good offices of the industry's Board of Arbitration and the U. S. Commission on Industrial Relations, the trade agreements were terminated by a lockout and protracted strike fifteen months later when the employers' Association demanded economic freedom and refused to permit the industry to remain a crucible of social reform.

Although protocolism failed, its elements became deeply embedded in the industry and they are the very principles which guide the actions of both the organized employees and the organized employers in the ladies' garment industry today.

467 pages. \$5.95. Mic 56-1959

THE FIRST CENTURY OF BERKSHIRE CULTURAL HISTORY

(Publication No. 16,915)

Richard Davenport Birdsall, Ph.D.
Columbia University, 1954

The purpose of this dissertation is to reconstruct the cultural life of Berkshire County, Massachusetts, in the first century following its incorporation in 1761. It attempts through a study of developments in religion, education, the press, the bench and bar, and literature to isolate certain truly local cultural influences and strains. The most important of the influences was the geographic remoteness of the county with the consequent frontier experience of the early years and the general sectional opposition to Boston. The main cultural strains were the dominantly Edwardsean religion, and a social liberalism. A history of early Berkshire culture, however, must include not only these uniquely local characteristics but also their interaction with numerous cultural streams flowing into the county from beyond the mountain barriers on either side. Yet during Berkshire's first century, few of the outside influences did more than fertilize an already existent native genius, and not until after 1860 did such influences become so all-pervasive as to make the very idea of a "Berkshire culture" a questionable hypothesis.

The most useful sources for Berkshire cultural history are the extensive files of those newspapers published in Pittsfield, Stockbridge, Lenox, Great Barrington, and North Adams during the first century; the manuscript collections of such leading Berkshire families as the Sedgwicks, the Dwights, and the Hopkinses; the county court records; and the excellent local histories by David Dudley Field, Josiah G. Holland, and Joseph E. A. Smith.

The emphasis has naturally fallen on those individuals and institutions transcending the merely local in importance and contributing significantly to the main currents of New England and American culture. Thus, in the early years of Berkshire County, the names of Samuel Hopkins, Jonathan Edwards, and Stephen West stand out above the rest. These were the years when Berkshire was virtually the intellectual and spiritual center of that great reconstruction of orthodox theology occurring in the aftermath of the Great Awakening. And in the next generation, several religious and secular leaders of Berkshire (Elder John Leland, Judge John Bacon, and Dr. Henry Halsey Childs) -- effecting in their persons a potent alliance of conservative theology and Jeffersonian political and social views -- assumed leadership of the statewide movement toward religious freedom.

The first quarter of the nineteenth century was primarily an era of practical achievement. The Berkshire Law Library was established; the famous Lenox Academy began its long career; an active local press was flourishing; and a son of Berkshire, Mark Hopkins, was elevated to the presidency of Williams College. In education Berkshirites demonstrated an unconcern for public education on the primary level which led Horace Mann to find the county nearly hopeless; but in secondary education, particularly for girls, and in higher education, the county was second to none. The Berkshire press was in no way outstanding, merely typical of rural New England. In legal affairs, Berkshire on several occasions took a position of leadership in efforts to increase the efficiency and the equity of

the Massachusetts bench and bar. Then, with William Cullen Bryant's arrival in Great Barrington in 1817, the literary flowering began -- to be dominated in the early years by the native voices of Bryant, Catherine Sedgwick, and Asa Greene and in the later years by a group of brilliant outsiders. Samuel Gray Ward, Nathaniel Hawthorne, Herman Melville, and Oliver Wendell Holmes all found the county an ideal literary workshop, and to them fell the task of writing the last chapter in Berkshire's first century of cultural achievement. 481 pages. \$6.15. Mic 56-1960

THE IMAGE OF THE CONSTITUTION IN
AMERICAN HISTORY: A STUDY IN
HISTORICAL WRITING FROM DAVID RAMSAY
TO JOHN FISKE (1789-1888)

(Publication No. 16,821)

Donald Roderic Raichle, Ph.D.
Columbia University, 1956

This is a study in historiography, an attempt to analyze the accounts, by American historians in the first century, of the formation of the Constitution of the United States. Fourteen historians are included: David Ramsay, Jedidiah Morse, Jeremy Belknap, Samuel Williams, Mercy Otis Warren, John Marshall, Richard Hildreth, George Ticknor Curtis, George Tucker, Hermann Eduard Von Holst, James Schouler, George Bancroft, John Bach McMaster and John Fiske.

The writings considered here are the work of Americans only. Moreover, only those who thought of themselves as writers of formal history and have been so considered by their successors have been included. This procedure has resulted in the elimination of historical writing in works referred to as "commentaries" as well as in analyses of American government such as those by Tocqueville and Bryce.

At attempt has been made to obtain complete coverage of the historical writing by those who lived through the era of Constitution-making. Histories of the American Revolution, state histories, John Marshall's nominal biography of George Washington which is really general history, and even the American Geography of Jedidiah Morse have been included.

The goal of complete coverage had to be abandoned when the nineteenth century historians were considered because of the increased output of historical works. After the spectator-historians, then, the study has been limited to the writings of those who wrote either general or constitutional history.

The study attempts to set forth the image of the Constitution as it was variously reflected by the individual historians and the times in which they lived. The currents of thought through which filtered the story of the establishment of the Constitution were many, but a few stand out. Partisan political views characterized the writing of the first generation of historians. Two of the later historians reflected in their histories the thinking of the formal schools of philosophy to which they gave faith. The utilitarianism of Richard Hildreth was followed half a century later by the Spencerianism of John Fiske. Other historians,

perhaps less deliberately but quite as effectively, infused their writings with their assumptions about the capacities of men for democratic government, their views on slavery, on the influence of economic interests in the establishment of the Constitution, and on the presence of the hand of God in history. There has been an attempt to examine the role of the historians in the creation of the "myth of the Constitution".

In addition to the histories of the Constitution and the other writings of the historians, contemporary reviews have been examined for the light they throw on the reception of the books at the time they were published.

An appendix, dealing with the plagiarism of the late eighteenth and early nineteenth centuries, is added to demonstrate that the writings of the spectator-historians dealing with the Constitution were original.

305 pages. \$3.95. Mic 56-1961

M. C. MEIGS, BUILDER OF THE CAPITOL AND
LINCOLN'S QUARTERMASTER GENERAL:
A BIOGRAPHY

(Publication No. 16,349)

Russell Frank Weigley, Ph.D.
University of Pennsylvania, 1956

Supervisor: Dr. R. F. Nichols

In a military career extending over half a century, Major General M. C. Meigs (1816-1892) supervised construction of the wings and dome of the United States Capitol under Presidents Franklin Pierce and James Buchanan and served as quartermaster general of the Union army throughout the Civil War and until 1882. His station from 1852 onward was the Federal capital, and there he was in close contact with the central political life of the nation. The present study emphasizes not so much the technical engineering and military aspects of his career, although logistical support of the Union armies receives extended attention, as the relations between Meigs the military officer and the civil government, the interplay of Meigs's character and personality with his official duties, and his reflections on the political events he witnessed.

The principal source has been the M. C. Meigs manuscripts in the Library of Congress. Sufficient progress has not been made in deciphering the Meigs shorthand journals of the 1850's to include their contents in the study. But for the period of the shorthand journals there exists a voluminous correspondence, with particularly rich letters from Meigs to his father; and for most of Meigs's career there are letter-press books, pocket diaries, boxes of miscellaneous incoming correspondence, and newspaper clippings. The records of the Quartermaster General's Office in the National Archives have been examined carefully.

Meigs's life as a young lieutenant of the Corps of Engineers at work on coastal and frontier fortifications, his contributions to the building of the Capitol, his thoughts on postwar Reconstruction of the South, and his place in the postwar army, all these appear. But two phases of his life are the principal foci of the biography. The first of these is Meigs's prolonged quarrel with Secretary of War John B. Floyd during the Buchanan administration, originating in

disagreements over patronage and contract policies but expanding in its implications to include questions of the relative powers of Congress and the executive and of the measure to which an army officer owes obedience to questionable orders from a superior. From the study Meigs emerges as a man of unflinching integrity and devotion to duty, but often tactless and irascible in his pursuit of duty. Secretary Floyd appears as an official perhaps not personally corrupt but easily victimized by unscrupulous men with an eye on governmental favors. The picture of James Buchanan conforms to the conventional one: a man well-intentioned but weak and vacillating.

The second focus is the work of Meigs in the supplying of the Union army. That the operations of Meigs's depart-

ment suffered from confusion and often corruption at the outset of the war is apparent; but in the long run the achievements of Meigs and his subordinates, and of the Lincoln administration in general, in the mobilization and maintenance of the army appear far more important than their failures. Once thoroughly in control of his department, Meigs was able to reduce fraud surprisingly in this prelude to the Great Barbecue. More than that, with no sufficient preparation in planning or experience, Meigs, his department, and the Lincoln administration were able to satisfy the needs of an army which expanded far more rapidly than did the United States Army in either of the world wars and then to maintain at a high level the supply of that army in the field. 780 pages. \$9.75. Mic 56-1962

JOURNALISM

PUBLIC ATTITUDES TOWARD THE PRESS

(Publication No. 16,840)

James Everett Brinton, Ph.D.
Stanford University, 1956

The study involves the construction and analysis of ten tests to measure public attitudes toward individual newspapers. The problem developed from a lack of use of any of the recognized methods of attitude scale construction in previous studies in the area.

The ten attitude areas or dimensions evolved for study were: Check on the government, general satisfactions, independence from pressures, adequacy of news, political-economic fairness, moral quality, racial-religious fairness, accuracy of news, responsibility of advertising, and political confidence. Between six and twelve questions were selected for each of the areas and a questionnaire was administered to a sample of 100 readers of the Palo Alto (Calif.) *Times*.

The responses were analyzed by Guttman scale analysis. With slight exceptions all of the scales except that for moral quality met six criteria of satisfactory Guttman scales. Reliability of the scales was computed by the Brown-Spearman formula and Guttman's L_3 and L_4 formulas and was found to range between .79 and .94.

A factor analysis was then performed on a matrix of intercorrelations among individuals' test scores. The Thurstone centroid process was used and three factors resulted. After rotation, the three factors were identified as: a general factor present in all tests; a bias factor, with high loadings in the tests for independence from pressures, political-economic fairness, and racial-religious fairness; and an accuracy factor, with high loadings in the tests for accuracy of news and responsibility of advertising. The three factors accounted for all but a small portion of the reliable variance of the tests, leaving only a small portion of variance that could be attributed to the specifically-defined content of the tests.

It was concluded that the tests could not be valid measures of their specifically-defined content areas, because the specific variance remaining was so small. Instead, the

field of attitude toward the press seems to be made up of a very strong general factor accompanied by two other factors, the bias factor and the accuracy factor. It is suggested that many previous studies of attitude toward the press, where a single question methodology has been used, may be subject to severe limitations in light of the presence of the strong general factor.

Future work in the area of attitude toward the press should include new factor analyses to verify the factorial findings of this study. The bias factor, because of its importance in studies concerning political bias in the press, should be the subject of investigation to obtain purer measures of it. Several research situations in which attitude toward the press might be an important variable are suggested. 132 pages. \$1.75. Mic 56-1963

THE RELATIONSHIP BETWEEN INTEREST AND PERCEPTION OF HEADLINE-TYPE STIMULI

(Publication No. 16,842)

Paul John Deutschmann, Ph.D.
Stanford University, 1956

In the United States 90 per cent of adults regularly see a daily newspaper, yet on the average each person actually reads only one-third to one-fourth of the newspaper available to him. The reader is selective. A large measure of the selectivity is a conscious affair, involving perception of units of newspaper content and subsequent acceptance or rejection of them as potential reading material. Mass media researchers have provided evidence that interests of readers play an important role in such selection. In addition, some researchers have suggested that motivational effects upon perception may operate in such a way as to account for part of this selectivity. There is a considerable body of psychological theory and experimentation which supports such a formulation, although interpretation of the data is controversial.

In this study, the hypothesis was advanced that interests, operating as motivational factors, facilitate perception of mass media stimuli. Theoretical background was drawn mainly from Bruner's "hypothesis theory." Two experiments were then conducted in which the relationship between interests and perception of headlines presented tachistoscopically was investigated.

Idiosyncratic interests were determined through three measures: (a) report of habitual readership of categories of newspaper content; (b) Q-Sort ratings of a set of headlines as to degree of personal interest; (c) ratings of a set of headlines as to degree of certainty that the subject would read the story which would accompany them. In addition, these three measures were combined, providing a summary estimate of interest. Group interests were investigated upon the basis of what is known of readership patterns by sex and age. Special interests were inferred from reports of behavior, such as ownership of stock, membership in Parent-Teachers Association, and membership in a church.

Test headlines were written for eighteen categories of news, including items designed to be of differential interest to sex and age groups, to stock owners, church members, and PTA members. The headlines were balanced for age and sex groups as to frequency of individual words, as to frequency of the four words in the headline, and as to length of word.

The effect of interests upon perception was determined by measuring the number of words the subject was able to report when test headlines were presented tachistoscopically

under conditions permitting him to see about half of the stimulus headline. The principal hypothesis was tested by determining whether the mean number of words perceived from stimuli rated high in interest was greater than the mean number perceived from stimuli rated low in interest. Sex, age, and objective interest hypotheses were tested by comparing the perceptions of the respective groups involved in each.

Three groups were tested, including twenty-three college students, thirty-nine young adults between age 30 and 45, and thirty-eight old adults between age 50 and 80. Each of the samples was approximately balanced as to sexes.

The results suggest the following conclusions:

1. No general effect of expressed interest upon perception, independent of age, was demonstrated.
2. There appears to be a relationship between expressed interest and perception for young adults and college age subjects, whereas there is no relationship for older adults.
3. Sex interests affected perceptions of college age subjects. The data were not conclusive for adults, although in the expected direction.
4. No effect of age interests upon perception was demonstrated.
5. One of the three special interests (ownership of stock) showed an effect upon perception.

The overall pattern of results indicate that further research in this area is warranted, to develop answers to some of the questions raised by this study, and to apply the techniques and findings to mass media problems.

154 pages. \$2.05. Mic 56-1964

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

THE BACKGROUNDS OF MALORY'S BOOK OF GARETH

(Publication No. 16,898)

Morton Donner, Ph.D.
Columbia University, 1956

Malory's Book of Gareth, the only one of the eight romances comprising the Morte Darthur which has not been traced to a definite source in the French Arthurian, is quite probably based on an early biographical romance like those written by Chrétien de Troyes and Renaud de Beaujeu. Since it is a generally acknowledged fact that such romances contain narrative elements derived from ancient Celtic tradition, the similarity between Gareth and the Sickbed of Cuchulainn (Serglige Con Culainn), an Irish tale dating from the ninth century, strongly suggests that this Irish tale has influenced the story of Gareth. As to how that influence reached Malory, it should be observed that the section of Gareth which parallels the Sickbed also resembles portions of eight other romances, all antedating Malory's--Erec, Yvain, Le Conte del Graal, Le Bel Inconnu, Wigalois, Le Chevalier de la Cote Maltaillié (in the Prose Tristan), Libeaus Desconus, Carduino. The ways in

which Malory's romance both corresponds to and differs from each of these others, however, indicates not that any one of them served as the source of the story of Gareth, but that they all share a common source with Gareth, a twelfth-century conte which presented the story of Gareth much as Malory tells it and which was itself indebted to the story of Cuchulainn as told in the Sickbed.

Gareth's role in Malory's romance not only resembles that of Cuchulainn in the Sickbed, but Gareth's history corresponds to Cuchulainn's in so many ways that Malory's hero ought to be considered an Arthurian counterpart of the Irish champion: the story of Gareth quite probably represents a synthesis of legends about Cuchulainn. Supporting this theory is the evidence provided by Welsh tradition. Gareth is apparently indebted to Gwri, a figure appearing in two eleventh-century texts, the Four Branches of the Mabinogi and Culhwch and Olwen, for certain characteristic traits, some of which Gwri himself inherited from Cuchulainn. Because it is a recognized fact that much of the Irish material which became part of Arthurian romance was absorbed into Welsh tradition before being transmitted to the Continent, the existence of a Welsh intermediary like Gwri aids considerably in establishing the connection between Cuchulainn and Gareth.

Dame Lyones, the heroine of Gareth, has in all likelihood derived certain of her characteristic traits from

traditional models also. Not only does her role in Malory's romance correspond to that of the heroine of the *Sickbed*, but many elements in her story reveal the influence of legends about Morgain, the ubiquitous fay of the Arthurian cycle. Thus, the story of Dame Lyones, too, probably represents a synthesis of traditional elements.

Certain of the more striking episodes in *Gareth* also show the effect of traditional influence. Gareth's adventures on his way to rescue Dame Lyones appear to derive ultimately from the Arawn episode in the First Branch of the *Mabinogi*; his adventures in rescuing Dame Lyones, from Welsh tradition about Mabon and from legends of Morgain; his adventures at the castle of Dame Lyones' brother, from two stories in the eighth-century Irish text *Feast of Bricriu (Fled Bricrend)*--The Champion's Bargain and The Visit to Cu Roi's Fortress; his adventures in the tourney at Dame Lyones' castle, from traditions about Morgain.

To sum up, *Gareth* illustrates the way in which many diverse elements from Celtic tradition may be combined to provide the narrative substance for a single Arthurian romance. 240 pages. \$3.10. Mic 56-1965

A STUDY OF THE STYLE OF THE KING JAMES
AND OF THE RHEIMS-DOUAY TRANSLATIONS
OF THE BIBLE: AN ILLUSTRATION OF
THE LITERARY CONSEQUENCES OF
DIFFERENT THEORIES OF TRANSLATION

(Publication No. 16,855)

Stanley Roswell Maveety, Ph.D.
Stanford University, 1956

In 1525 William Tyndale commenced publishing English biblical translations, and in 1528 his work was attacked by Sir Thomas More who objected specifically to Tyndale's translation of certain biblical words. Tyndale had changed, among others, the traditional translation of "charity" to "love," "church" to "congregation," "priest" to "senior." These objections were basically doctrinal rather than stylistic. But in the following years, as Protestants and Catholics formulated more clearly their doctrinal positions, these positions in turn affected the style of biblical translation. One may study the Catholic and Protestant attitudes toward the English Bible translations by reading the statements of policy which preface some of the versions, and also in the attacks which answer these statements between 1528 and 1611.

In general the differences may be considered under three heads: First, the Catholics translated the Latin Vulgate of Jerome, whereas the Protestants worked from Hebrew and Greek sources. Second, the Protestants, though they did not sanction an unduly free style of translation, were less literal than were the Catholics. Third, the Protestants who made the King James version deliberately sought to produce a style that would be eloquent and at the same time understandable to the common reader, while the Catholics, in the Rheims-Douay translation, refused to accommodate their translation to the uneducated and wrote in a plain though Latinate style.

In general the style in the King James version is clearer and more appropriate than is that in the Rheims-Douay.

Occasionally, however, in simple or colloquial passages the Rheims style is more effective.

In the history of the criticism of these two versions two charges have been made repeatedly which the author challenges. The King James translators did not make a practice of perverting the text for the sake of style. On the other hand the Catholic translators did not intentionally make use of Latinate neologisms in order to obscure the meaning of the Bible. 216 pages. \$2.80. Mic 56-1966

THIS POWERFUL LINE: A STUDY OF
WILLIAM CHAMBERLAYNE'S *PHARONNIDA*
AND THE EPIC TRADITION

(Publication No. 16,908)

Kenneth Sprague Rothwell, Ph.D.
Columbia University, 1956

William Chamberlayne--Dorsetshire Cavalier, Anglican, and physician--designed his five-part heroic romance in verse, *Pharonnida* (1659), as an epic which would both delight and instruct through an idealized imitation of nature. *Pharonnida*, virtually ignored in its own day, was the object of considerable attention in the Romantic period by Southey, Brydges, and Jeffrey. Singer's 1820 edition and an allusion to *Pharonnida* by Poe furnish additional evidence of wide-spread interest in Chamberlayne.

Pharonnida's claim to epic status stemmed from the Italian merger of romance and epic as advocated by Giraldi and Scaliger and practiced by Ariosto and Tasso. Sir William D'Avenant's *Gondibert* was an immediate English precedent, though *Pharonnida* also borrowed from Heliodorus' *Aethiopian History*, Sidney's *Arcadia*, and Barclay's *Argenis*. *Pharonnida*, by its emphasis on heroic love and virtue, can also be compared with the French romances of D'Urfé and the Scudérys. Two episodes--the Princess *Pharonnida*'s dream (I,v) and the temptation of Argalia (III,iii)--were imitated from Spenser.

Structurally *Pharonnida* is modelled on the *Aethiopica*, though Chamberlayne superimposed the five-part dramatic organization for English epic advocated by Sir William D'Avenant in 1650. Despite this concession to neoclassic theory, *Pharonnida* remains an essentially Gothic work. Unity in *Pharonnida* depends less on dramatic structure, which is weakly developed, than on ironic correspondences among apparently unrelated episodes offering thematic variations on love, honor, and ambition. While Chamberlayne relied on the literary patterns of older romance, he could also draw--as in the Alcithius episode--on personal experience in the Rebellion for inspiration. He certainly implied a parallel between the merger of the Aetolian-Morean-Epirot crowns and the English fight over succession. Throughout *Pharonnida*, as always in romance, Chamberlayne subordinated characterization to action, setting, and theme.

For thought patterns, Chamberlayne--a conservative in religion, politics, and philosophy--drew heavily on Anglican theology, neostoicism, and neoplatonism. Gothic elements combine with a Laudian bias to make *Pharonnida* a poem Catholic in sensibility. Seventeenth-century neostoicism is reflected in the heroic characters who face

disaster and triumph with equal aplomb. Neoplatonism impinges on Chamberlayne's cosmology and courtly love motifs. Satirical thrusts, directed at the love conventions in the court of Charles I, are also apparent. Chamberlayne's training as a country physician, the object of considerable study in this dissertation, did not encourage him to abandon the conventional medical figures of Renaissance English poetry. His medical images--as compared with the figures of Sir Richard Blackmore--are more literary than factual, and follow the well-worn tradition of the Spenserian and Fletcherian "allegory of the body." Chamberlayne made extensive use of astral imagery, but here again he was largely untouched by the new science.

As a poet Chamberlayne was eclectic. He showed Spenserian traits, but employed a vocabulary more akin to the aureate, non-English diction of Sir Thomas Browne than Spenser. He sometimes yoked together fantastically disparate classes of things, but his conceits lack the wit and tension in genuine "metaphysical" verse. He built his tortured and "manneristic" sentences on enjambed couplets, which occasionally lapse into a foreshadowing of the neoclassic closed couplet. Yet in his eccentric fashion Chamberlayne embraced nearly all the divergent tendencies in English poetry on the eve of the Restoration revolution in taste. 346 pages. \$4.45. Mic 56-1967

THE NOVELS OF ANNE DOUGLAS SEDGWICK

(Publication No. 16,779)

Grace Evelyn Swanson, Ph.D.
New York University, 1956

From her earliest attempts, particularly in *The Confounding of Camelia*, *The Rescue*, and *Paths of Judgment*, Miss Sedgwick reveals her interest in the well unified psychological novel delineating character. While Henry James was Miss Sedgwick's foremost master in her artistic and psychological method and while she treats a number of his characteristic themes and subjects, George Meredith must have sharpened her awareness of the character type, the egoist, and supplied her with a view of comedy, which she modified to suit her own temperament. Moreover, she shows her kinship to him in analyzing human perversity directly, rather than clothing it in mystery as James does.

In two of Miss Sedgwick's most competent novels, she studies the egoist and his relations to other people--Madame von Marwitz, the "artist-egoist," in *Tante* and Ludwig Wehlitz (modeled on Nietzsche), the "philosopher-egoist," in *The Encounter*. In other novels Miss Sedgwick analyzes the spiritual growth of some of her characters, the heroines, for instance, of *Adrienne Toner* and *Dark Hester*, exposes the limitations of self-righteous humanitarianism in *A Fountain Sealed*, attacks the naturalistic view of love in *The Little French Girl* and *The Old Countess*, depicts the restricting influence of a possessive father-daughter attachment in *A Fountain Sealed* and in *Philippa*, and describes the conflicts of the Victorian and modern generations in *Dark Hester*.

In her novels interpreting the American character, Miss Sedgwick draws several uncomplimentary portraits of young women. Though they possess many of the traits

James portrays, her Americans are distinct individuals, different from his. She usually characterizes Americans as generous, practical, serious, idealistic, self-assured, and enthusiastic about "accomplishing" something. She satirizes Imogene Upton (*A Fountain Sealed*) for her egotistical righteousness and her severe censure of her mother; she portrays unimaginative Althea's search for charm (Franklin Winslow Kane), and satirizes Adrienne for her dominating spiritual pride and ingratiating manners; when Adrienne learns humility, the author's characterization becomes sympathetic. The older American women, Mrs. Talcott (*Tante*) and Mrs. Fennamy (*The Encounter*) are delightful characters sympathetically portrayed. Valerie Upton, Imogene's mother, a woman of sensitivity and patience, is one of the novelist's most outstanding heroines, who achieves a felicitous combination of American initiative and independence and a European attitude of acceptance. Franklin Kane, one of Miss Sedgwick's few completely plausible male characters, is pragmatic in his view of life and more understanding, reliable, and magnanimous than any other character--English or American--in the novel named for him.

Helen Buchanan, the English heroine of the same novel, is another convincing and vivid character. She is more materialistic than Althea and less interested in "doing" than in "being." She and Oldmeadow, the English hero of *Adrienne Toner*, are skeptical and somewhat more conventional than most of Miss Sedgwick's Americans. Both possess an ironical sense of humor and a candor James often attributes to Americans.

The novels contrasting the French and the English contain few individual characters. In *The Little French Girl*, Miss Sedgwick upholds the English marital custom which allows a girl more freedom in the choice of a husband than the French traditionally allow. Though the French heroines, Alix (*The Little French Girl*) and Marthe (*The Old Countess*), are excessively localized, Madame Vervier, Alix's mother, is persuasively presented. In both novels the author depicts the setting and the activities of the people with authenticity.

Miss Sedgwick characterizes women more realistically than James does and idealizes men more than he. While his characterizations emphasize their mental processes, hers emphasize their emotional development. Though many of her characters are sensitive, they are not as "self-conscious" as his. Precocious young women and charming middle-aged women figure more prominently in her novels than in his.

Miss Sedgwick writes in a clear, figurative, quick-moving style, sometimes ironical and witty. She introduces the recurrent image (undoubtedly borrowed from James's later novels) effectively and in most novels she is singularly apt in revealing a character's individuality through dialogue. Her sentimentalizing some of the love relationships and idealizing some of her characters, especially men, keep her fiction from being as realistic as it might have been. She is generally more successful in attaining the comic and the pathetic than the tragic. Her comic irony is usually less detached than James's and Meredith's and closer to Molière in the sharpness of its thrust. Yet even when she satirizes her characters, I think she conveys a greater compassion for them than Edith Wharton does for those she satirizes.

While Miss Sedgwick was not a major novelist, she left a number of living and memorable characters and

some interesting interpretations of different national types. She also revealed an acute insight into many human relationships and wrote in a style often distinctive for its lucidity and pungency of phrase.

366 pages. \$4.58. Mic 56-1968

LANGUAGE AND LITERATURE, MODERN

LE MONDE FANTASTIQUE DES ROMANS DE PIERRE MAC ORLAN

(Publication No. 16,799)

Adèle Bloch, Ph.D.
Columbia University, 1956

The first chapter presents the biography of Pierre Mac Orlan. He was born in Péronne, Picardy, in 1883, lost his parents at an early age, and moved to Orléans with his uncle, who reared him. As an adolescent, he ran away from home, in order to seek adventure in Montmartre, where he spent the following years in squalor, since he was unable to find a steady position. After having tried to become an artist, he became a humoristic writer in 1911. The war interrupted these beginnings, but he resumed his literary activities after his discharge from the army in 1917. The publication of his *Chant de l'Equipage* paved the way to a long and successful series of novels of escape, while he also pursued a reporter's career. In 1926, he retired to a farm on the Petit Morin, where he still lives. Somewhat forgotten just before and during the second World War, he was nevertheless elected to the Goncourt Academy in 1952.

The second chapter deals with the influences that shaped his talent. Mac Orlan has always admired the bohemian literature rather than classical works. He was fascinated by medieval treatises on witchcraft, by documents on piracy, such as Captain Johnson's or Exquemelin's, and by the poetry and novels celebrating the life of outlaws, such as "Cartouche" or Moll Flanders. He was also interested in German romantic writings like Hoffman's or Arnim's, in English Gothic novels, and in Gérard de Nerval's works. Poe's weird tales impressed him throughout his life, and so did Marcel Schwob's stories, Stevenson's adventure novels, and Kipling's exotic descriptions. Some contemporary authors also influenced him, especially those whom he personally knew, such as Francis Carco, André Salmon, and Joseph Conrad. The current events of his time, especially the revolutions and the murders, also played a part in the development of his imagination.

The next four chapters deal with Mac Orlan's theory of adventure, as exposed in his novels of escape. According to him, real adventure cannot be found in actual experience; it can only exist in the mind of the "passive adventurer," who romanticises the ruthless actions of the "active adventurer." Mac Orlan's novels are divided into three categories: first, the novels presenting outlaws from many epochs, such as pirates, prostitutes, bootleggers and legionnaires. The next category celebrates the apocalyptic quality of the modern era, in novels painting a strange picture of revolutionary terrors and criminal ventures.

Finally, the novels dealing with a supernatural theme display witchcraft and satanism seen under a serious or ironic light.

The next two chapters analyze Mac Orlan's style, which is characterised by a combination of lyricism and humour. His poetic quality imbues both his verse and prose with a special pictorial appeal, that enlivens the backgrounds which he paints with art and care. The creation of an atmosphere is the author's most important concern and he can suffuse a scene with a strange light, through the use of metaphors, symbols and a particular humor that varies from the farcical parody to macabre wit destined to disturb the reader.

The last chapter analyses Mac Orlan's creation of a bizarre aura, obtained by intermingling realism with utterly fantastic happenings. He may depict an impossible situation with the most concrete, casual means or inject a dreamlike quality into the most commonplace description. His originality rests on the ability to impose upon the reader paradoxical antitheses endowed with the disquietening appearances and plausibility of reality.

260 pages. \$3.35. Mic 56-1969

GEORGE W. CABLE AS A SOCIAL CRITIC: 1887-1907

(Publication No. 16,892)

Charles Philip Butcher, Ph.D.
Columbia University, 1956

George Washington Cable (1844-1925) is noted as a distinguished local color writer who depicted exotic ante bellum Louisiana, but his achievement as a reformer, civic benefactor, and social critic has been given relatively little attention. In his early fiction (*Old Creole Days*, *The Grandissimes*, and *Dr. Sevier*), in his history (*The Creoles of Louisiana*), in his redaction of old manuscripts (*Strange True Stories of Louisiana*), and in his controversial essays (*The Silent South* and *The Negro Question*), Cable vigorously attacked the social injustices of his time. He insisted that a democracy could not tolerate slavery, caste, segregation, or a disfranchised peasantry denied access to adequate public education. He protested the exploitation of the Acadian, the poor white, the immigrant, the convict and asylum inmate. In print and on the lecture platform he urged that the nation, and particularly the New South, grant civil rights to the Negro.

As a champion of the cause of the freedmen, Cable made himself personally acquainted with colored leaders, acting on his conviction that the Negro must be treated in accordance with his individual merit rather than his racial identity. The extent of Cable's emancipation from the traditions of his native New Orleans was apparent when he dined with a Negro family in Nashville. This act, which he explained but did not repudiate, helped to kill his Open Letter Club, a project designed to stimulate dispassionate study of southern problems and to resolve them by applying the principles of democratic idealism.

Shortly after he moved to Northampton, Massachusetts, in 1885, Cable founded the Home Culture Clubs. At first an ephemeral scheme for promoting "culture" in the home by means of fireside reading clubs, the project became a

quasi-municipal agency which provided important services for the immigrants and other underprivileged people of the community. This development was due largely to the industry and talent of Adelene Moffat, a young artist whom Cable met on a reading tour in Tennessee in 1887 and whom he induced to move to Northampton to assist him. For almost twenty years these two dedicated themselves to what they called "the dear good work." Yet Cable failed to make proper acknowledgement of Adelene Moffat's devoted management of the Home Culture Clubs and discharged her abruptly in 1907.

The hundreds of letters these collaborators exchanged over this twenty-year period, half of them now in the Howard-Tilton Memorial Library at Tulane University and half, recently acquired, in the Cable Collection at Columbia University, illuminate little known facets of Cable's character. The Cable-Moffat correspondence and related papers treating their association are among the major sources for this study of the author's role as a social critic.

Cable's experiences on two significant visits to Tennessee and his probable familiarity with the career of Adelene Moffat's father are reflected in his novel of Reconstruction, *John March, Southerner* (1894). From this point on, Cable became less a social critic than a social historian and romancer. Possibly because of his altered circumstances, his increased age, the spirit of the times, and changes in his character, the author abandoned the controversies in which he had once been a leading contender. His later years were devoted to buttressing his literary reputation as a master of the charming Creole scene and to innocuous civic enterprises likely to fulfill the pious hope of his youth that the world would regret him when he died.

297 pages. \$3.85. Mic 56-1970

**SIR JOHN HAWKINS' LIFE OF JOHNSON:
A REAPPRAISAL**

(Publication No. 16,896)

Bertram Hylton Davis, Ph.D.
Columbia University, 1956

In 1787, four years before the publication of Boswell's *Life of Johnson*, Sir John Hawkins published his 600-page *Life of Samuel Johnson, LL.D.*, known to modern readers primarily through Boswell's vilification of it as inaccurate, uncharitable to Johnson, and hopelessly digressive. Similar to Boswell's comments were those of Hawkins' reviewers, who, in addition to the faults singled out by Boswell, condemned Hawkins' criticism of Johnson's works, his legal style, and his failure to acknowledge material lifted from other sources.

For the most part, the judgment of Boswell and the reviewers has remained unchallenged. Yet a thorough study both of Hawkins' book and of the work of modern scholars reveals that Hawkins' detractors have done him a signal injustice. An intimate friend of Johnson, and one of the same generation, he brought to his task not merely the diaries and other manuscript materials left in his custody as one of Johnson's executors, but also a personal recollection of Johnson which reached back to the decade of the 1740's, when Johnson was still a young man establishing

himself in his profession. To complete his picture of Johnson, Hawkins solicited information among his wide acquaintance, and he drew (not as a plagiarizer, but as a scholar) upon several brief biographies published almost immediately after Johnson's death, as well as upon the great storehouse of Johnsoniana in the periodicals. Thus his portrait is full-length, with all the authenticity of a work executed from the life. And it is a work of remarkable insight.

Not that it is without defects. Its style is over-formal, legalistic, uneven. Hawkins' critics, however, have almost invariably called attention to the book's defects without regard for its many virtues. Hawkins' supposed malevolence, for example, is easily recognizable as an earnest attempt to see Johnson as he was. He could not commend such traits as Johnson's idleness, his slovenly appearance, or his indiscriminate bounty. But his rebukes of Johnson must be studied in conjunction with the many examples of his profound and abiding admiration for the man whose greatness he never for a moment questioned. Likewise, Hawkins' inaccuracy must be viewed in context. The book contains many errors of fact. But as a pioneer in Johnsonian biography, Hawkins deserved a liberal allowance for error, and it is greatly to his credit that on some points of Johnson's career he should prove a more reliable authority than Boswell. As critic, Hawkins commands respect particularly for his insight into Johnson's political works. A keen political observer, he was able to interpret intelligently both the radicalism of Johnson's early satires and the Toryism of the later tracts, and his admiration for Johnson's parliamentary reporting prompted some of the most incisive comments ever made on that neglected phase of Johnson's career.

Dealing as it does with one of England's most interesting and best loved men, Hawkins' *Life* is not a book for the specialist alone. For all readers it affords an intimate, first-hand glimpse into the central figure of his age. And Hawkins has very properly re-created Johnson's age for us. The "digressions" which his critics have so roundly denounced grew out of his awareness of Johnson's central position, for he saw that Johnson could be best understood in the milieu in which he moved. Thus he introduced into his *Life* numerous accounts of Johnson's contemporaries and of eighteenth century customs and institutions. The book is, in fact, the first life-and-times of Johnson, and today -- even though it has not been reprinted since 1787 -- it remains second in authority only to Boswell's.

272 pages. \$3.50. Mic 56-1971

**CHARACTERS AND CONSCIENCE: A STUDY OF
CHARACTERIZATION AND MORALITY IN THE
NOVELS OF WILLIAM DEAN HOWELLS**

(Publication No. 16,805)

Kenneth Eugene Eble, Ph.D.
Columbia University, 1956

This study proposes that the merits of William Dean Howells as a novelist reside primarily in his creation of character and in the intensity of his moral concern. His characterizations capture a wider range of the American character in the period between the Civil War and World

War I than those of any other novelist. His best figures, men like Bartley Hubbard, Silas Lapham and Jeff Durgin, are significant both as individual creations and as representatives of a type, in this instance the type of commercial man which was Howells' chief contribution to American fictional materials.

The many characters in the novels are classified into dominant types, and these types are grouped into the opposing forces of good and evil. The chief representatives of goodness are the ingenue, the good young man, and the married couples they became; the primitive from the early American frontier; and the provincial characteristic of America at a slightly later date. On the opposing side are the not-so-villainous villain, a good young man whose conscience proves inadequate to the demands self-indulgence and the hunger for social status put upon it; the commercial villain, for whom money and power are the chief morality; and the minor types, the seducer, the drunkard and the bad woman, which chiefly indicate Howells' connection with the sentimental novel.

The conflicts between the major character types bring out (1) the values Howells prized, (2) the moral conflicts within the individual, and (3) the social struggle between self-interest and the common good. Influenced by his fondness for the literature and ideas of the eighteenth century and by his upbringing in an Ohio not far removed from the frontier, Howells was committed to the values of the rational mean, the idea of man's natural goodness, and the beneficent effects of a comfortable marriage to an inherently virtuous woman. Falseness to self and disregard for others he regarded as among man's worst sins, principally because they are so rooted in man's nature and because they so easily escape scrutiny and correction. The man who most embodies Howells' values is the autobiographical figure Basil March, an ordinary, erring human chiefly distinguished by his awakened conscience, his belief that every man is responsible to his fellow man, and his feeling that the good society can only develop from righteous individuals. Such a philosophical position finds its historic ideal in the life of Christ.

Howells is pre-eminent in depicting through his characterizations and their conflicts the change in American society from rural to urban and the accompanying changes in values. His major masculine figures are all involved in the clash of older values with a new commercial ethics, a clash in which such ideals as community service, dedication to art and ideas, the assumption of moral responsibility for self and for mankind are replaced by the morality of personal power, dedication to the acquisition of wealth, and responsibility only to compete with and excel one's fellow man. The intensity of his concern and accuracy of his observations make his economic novels, *A Hazard of New Fortunes* foremost, his strongest work, but the problems of personal and social morality run through almost all of his novels. His bond with Tolstoy, the novelist he regarded as supreme, and with those English novelists which F. R. Leavis calls the "Great Tradition"--Jane Austen, George Eliot, Henry James and Joseph Conrad--is this intense moral interest in human nature.

265 pages. \$3.45. Mic 56-1972

BARBEY D'AUREVILLY, CRITIQUE LITTÉRAIRE

(Publication No. 16,810)

Gisèle Corbière Gille, Ph.D.
Columbia University, 1956

Barbey d'Aurevilly (1808-1889) has been the subject of much controversial criticism. His fiction won recognition right away, but his voluminous work as a critic never enjoyed the same prestige. Some did deplore this lack of appreciation, but his *Les Oeuvres et les Hommes* remained nonetheless unknown to many scholars, and no general study has been devoted to them heretofore.

Yet, the critical works of this "High Constable of Letters" are most interesting in spite of their uneven merits. First, it became possible to draw from them a theory of criticism. Criticism, according to Barbey, should proceed from intelligence and truth, and, at the same time, judge creative works from the standard of beauty. Anxious to defend its unity and authority, it derives its guiding principles from a philosophical system. For Barbey, these can be summed up in a threefold symbol: the cross, the scale and the sword. The cross - meaning Roman Catholicism - weighed heavily on Aurevilly's opinions about philosophers and thinkers. The scale, or the obligation to be just, compels the critic to proclaim his verdict, whatever it may be, to guard his independence most jealously, to acknowledge the merits of every one, to pick up errors and shortcomings. As for the sword, it turns criticism into a guardian of Beauty and Good, two ideas as inseparable in the mind of Aurevilly as Art and Morality.

This constant concern for morality explains in part Barbey's advocacy of his critical method: the study of man and his works. From the author he asks a religious (Catholic) spirit; a social outlook (regard for morality); an individualistic attitude, which in turn gives rise to such other criteria as originality, talent, sensibility, loftiness of mind, love of truth, enthusiasm, independence, disinterestedness, taste for hard work. From the works Barbey demands real though idealized subject matter, undeniable unity, sound structure and style. From the critic he requires particularly intellectual and moral qualities: impartiality, sincerity, sensibility, disinterestedness, above all intuition, the gift supreme that will make him a creative artist. No one in Barbey's eyes ever attained this ideal - neither Diderot, nor Fréron, nor Joubert, nor Macaulay, whom he nevertheless proposes as models, for various reasons.

The dissertation proceeds to the study of Barbey's conception of the great literary genres: of poetry, innate, spontaneous, striving to awaken an emotion in the soul; of the novel, which studies the modern epic story of man and society; of history, or the science and art of investigating social laws and seeking truth; of the theater, seemingly on the decline. There follows a study of Barbey's opinions about the most representative writers in each of these categories. They illustrate, to a remarkable extent, the twin nature of his criticism: dogmatic in principle, it is also personal and impressionistic by virtue of his passionate nature and his violent reactions to men and their works. That is why it is difficult to assign him his proper rank among critics. He stands out for his moral qualities, for the nobility of his ideals, for his synthetic spirit and his striking expressions, for the originality of his point of view, for his style, finally for his intuitive judgments about

such contemporaries as Balzac, Stendhal, Maurice de Guérin, Baudelaire ... His brutal frankness links him to the battalion of outspoken critics and makes him a most vigorous defender of beauty, truth and literary freedom.
522 pages. \$7.00. Mic 56-1973

THE POEMS OF SIR ROBERT AYTON,
ENGLISH AND LATIN

(Publication No. 16,843)

Charles Bennett Gullans, Ph.D.
Stanford University, 1956

This is a critical edition of the poems of Sir Robert Ayton, 1569-1638, with a biography. It contains nine new English poems from contemporary manuscripts, or 56 in all, and four new Latin poems, two from contemporary manuscripts and two from contemporary printed sources, as well as the text of these Latin poems given in the *Delitiae Poetarum Scotorum*, 1637. Poems which have been assigned on inconclusive or faulty evidence to William Drummond of Hawthornden, Sir William Fowler, Sir James Sempill of Beltrees, Sir John Suckling, Sir Walter Raleigh, William Strode, and others are here returned to the canon of Ayton's English poems; and the problems involved in doing so are discussed in detail. The text of "Auld Lang Syne" as printed by Watson in 1711 and formerly given to Ayton is not included, since the attribution is without authority.

This is the first old-spelling text of the poems and the result of the first collation of the major manuscripts and of all accessory texts which could be found. The text has been established on the basis of British Museum MSS. Additional 10308 and 28622, contemporary printed texts where such exist, and such accessory manuscripts as contain poems not included in the Ayton manuscripts. The textual value of common-place book, printed miscellany, and song-book texts is strongly questioned; and, although variants from them have been freely included in the textual notes, it has been done largely to document the peculiar degeneration of texts of non-scribal origin which is inherent in method of their transmission, and not because such variants represent admissible alternative readings to those of the copy-texts. This is the major editorial assumption. It is further argued that it is not possible to construct a stemma which shows the relationship of particular individual texts, although group relationships can frequently be shown.

The life consists largely of new material drawn from contemporary records, English and Scottish, official and private. The family history is largely new, being drawn from the contemporary genealogy by Sir James Balfour, the accuracy of which has been substantiated at large from Scottish records. Ayton's early life is still obscure, and the period from 1589 until 1603 is still a complete blank. The new information applies largely to the years from 1603 until his death.

483 pages. \$6.15. Mic 56-1974

THE LITERARY CRITICISM OF SAINT-EVREMOND

(Publication No. 16,812)

Quentin Manning Hope, Ph.D.
Columbia University, 1956

This dissertation attempts to define the spirit, scope, and content of Saint-Evremond's criticism. The first chapter examines the limitations and insights which result from his concept of himself as an *honnête homme* who writes "des bagatelles" for his own amusement; he is overimpressed by versatility but unusually aware of the relationship between the author's personality and the work. Similarly, his own experience and his interest in history attracted him to the relationship between literature and society, and this makes him one of the first literary historians.

The drama attracted his attention more than any other genre. His criticism of Corneille is not, as it has been called, that of a polemicist or an *attardé*. He admires in Corneille the faithful representation of Roman qualities, the distant and admirable heroes, the technique of overwhelming rather than persuading the audience, the penetration and plenitude of characterization, the subtle observation of the last plays. Basically, however, it is supreme diversion rather than recognition which he seeks in Corneille, for his own system of values is an entirely different one.

His criticism of Racine is less perceptive and sympathetic; he can see in him no more than a successful imitator of the Greeks. He is much closer to Molière, whom he imitates in his own plays. He admires and resembles Molière's *raisonneurs*, and he joins him in satirizing doctors and *précieuses*. Refusing to judge English literature by French standards, he calls Jonson the equal of Molière. Yet he knew very little English; his intellectual curiosity was lively but unadventurous.

Saint-Evremond comes close to condemning all poetry in the name of reason. He calls it "the language of gods and fools." But the gods are usually silent. Most imagery is merely distracting, either exaggerated or tedious. Poetry must be reasonable: its function is to elevate the soul by portraying with grandeur and dignity important historical events and personalities, and to convey knowledge, by presenting them deeply and truly. It must be dramatic and historical. Two passages in Lucan best exemplify these qualities. His own attempts to write poetry in this vein are worse than mediocre, and his whole view of poetry is peculiarly narrow.

Saint-Evremond calls for a broader concept of history, and a new kind of historian who will combine wide experience of human affairs with a nice sense of balance. He condemns antiquarianism, but recognizes the value of research. Although he is convinced that history must offer moral instruction, his own approach to the subject is skeptical and psychological. He carefully measures the temperament, ability, and policies of great historical figures, stresses the influence of the spirit of the times, public opinion, and morale, the way in which men are influenced by "fictions," the failure of most historians to grasp the fundamental differences between one period and another.

The final chapter of the dissertation, by studying the use Saint-Evremond makes of certain key-words, shows how his criticism is an expression of his personality. *La*

délicatesse, le discernement, la pénétration, la finesse are ways of perceiving; they must respect the limits of le bon sens. They reveal les choses cachées, or, when they become over-subtle, les mystères. L'exactitude is tiresome, but le caprice, l'imagination, la fantaisie are usually foolish and unreasonable. In style, le naturel and le facile are desirable but not identical qualities; la force must be distinguished from la dureté. La liberté is preferable to la contrainte, l'animation to la langueur. Le sérieux is rarely admirable, but la joie is man's most desirable possession.

A critical bibliography is appended to the dissertation.
258 pages. \$3.35. Mic 56-1975

THE POETRY OF THOMAS HARDY

(Publication No. 16,813)

Samuel Lynn Hynes, Ph.D.
Columbia University, 1956

Although Thomas Hardy occupies an apparently secure position among English poets, he has not been given the critical attention which that position would seem to deserve. The bulk of bad poetry in his *Collected Poems*, his limited range of tone and ideas, and his determined philosophizing are all probably contributing factors in this neglect.

Perhaps another reason for Hardy's failure to attract passionate partisans lies in his personality, or rather in the persona which he projected through his verse and prose writings. By his extreme reticence he cut himself off from his readers; and by withholding publication of his poems until his career in fiction was over, he made his writing of verse appear a supplementary occupation, which all other evidence indicates it was not.

The central problem in an evaluation of Hardy's poetry is the "personal rhythm," which is generally felt to be at once the most characteristic and the least poetic quality of his verse. But in the harshness and oddness of his style Hardy has much in common with other late Victorian poets; one might link him with poets like Hopkins and Patmore in his efforts to impose a new movement and a new texture upon English poetry.

Because Hardy set himself up more or less publicly as a thinker, his poetry has most often been approached in terms of its ideas. Hardy's thought is best seen, however, not as a philosophic system, but as an aid to the verse, rather like Yeats' *A Vision*. Hardy's philosophy provided him with a "dialectic of irony," a pattern of contrast between appearance and reality; this dialectic appears in the structure of many of the poems, as well as in the major novels and in *The Dynasts*.

Hardy's diction, which has been the subject of much adverse criticism, may also be approached in terms of the "dialectic of irony." Hardy drew his vocabulary from a wide range of sources--archaisms, dialect, the vocabularies of special groups, regionalisms--and used words in combinations without regard for decorum. The effects, however, are often both complex and effective, one kind of word operating as the ironic qualifier of another, and thus establishing complex attitudes in the poems through diction alone.

A similar dialectic exists in the imagery of Hardy's poems; two worlds are set in juxtaposition--one the sunny,

summer world of youth and illusions, the other the dark, winter world of mature disillusioned reality.

In examining Hardy's poetry, critics have tended to treat it as all of a piece, implying that there is no discernible development of technique. If one compares early and late versions of the same poems, however, it becomes clear that Hardy was in fact a careful reviser, guided by well-defined standards. More than half of the poems in the first three volumes were revised at one time or another, many of them extensively. These revisions are in the direction of precision, tautness, and richness of suggestion; almost without exception they are obvious improvements. They show a careful development of the distinctive Hardy style.

The final image which one takes from a reading of Hardy's poems is of the man--a man of great, inflexible integrity who saw the world as a tragic irony, and who tried to make his poetry the direct and honest mirror of that vision. But we should also be aware of the other aspect of Hardy--of the dedicated, and technically capable, poet. Though one cannot dismiss his failures, Hardy wrote enough supremely successful poems to justify a high final evaluation of him as a poet.

206 pages. \$2.70. Mic 56-1976

HENRY JAMES'S REVISIONS OF THE PORTRAIT OF A LADY: A STUDY OF LITERARY PORTRAITURE AND PERFECTIONISM

(Publication No. 16,817)

Sydney Joseph Krause, Ph.D.
Columbia University, 1956

In almost everything he wrote Henry James was motivated by the most insistent drive for artistic perfection. To study James's revisions of *The Portrait of a Lady* is to trace the very process and result of his perfectionism. As revision for James meant nothing less than the complete reactivation of the work in his imagination, his intentions in revising become clear only when each revision is projected against the background of his method and themes. That is the analysis proposed in this dissertation with the aim of gaining an intimate view of James's art as the pursuit of perfectionism.

James's themes in *The Portrait* develop around the aesthetic and moral motivations of his characters. Broadly, the aesthetic motivation has to do with making a work of art of life, and the moral motivation has to do with the adjustment of freedom and restraint. The particular elements of each are to be found mainly in Isabel Archer's growth to moral maturity and in the "finesse" of her general comportment. The thematic revision has principally to do with matters of emphasis, tone and clarity. James did not alter his original thematic ideas, but he did deepen, extend and ramify them. The result is a more intensified presentation, as situations formerly uninvolved or only slightly involved with the major themes are given greater thematic relevance.

Greatly enhanced in revision was James's method of literary portraiture, which involves the depiction of moral and mental states by the tangible analogues that symbolize them, and the framing of characters and scenes for the

effect of rendering them as symbolic pictures. In this tendency it is quite possible that James may originally have been influenced by Hawthorne.

In some important revisions James gave more explicit treatment to the difference between how Gilbert Osmond and Ralph Touchett regard Isabel as a work of art. James also underscored the hyper-aestheticism of Osmond and Madame Merle. He suggests how they often blur the distinction between life and art to the reciprocal damage of each. Osmond makes a Lady and a work of art of Isabel, but she becomes a mere projection of her creator's ego; whereas Ralph's love for Isabel is well grounded morally and aesthetically because he loves Isabel in and for herself. Thus the aesthetic and moral motivations interact.

James had the delicate problem of portraying Isabel as young and naïve, but as also capable of a moral determination which could deal with great adversity and triumph over it. So in revised descriptions of Isabel James frequently cut or toned down connotations of willfulness. James made great changes in the characterization of Caspar Goodwood, who becomes a more flexible and more complicated person. He clarified and emphasized the good motivation of all the American characters while he heightened the evil of European influences. In changing passages which might be construed as gratuitous criticisms of Americans, James apparently considered the American sale of his Definitive Edition.

A less important aspect of revision is the matter of style. James's first revision of *The Portrait* from magazine to book publication clearly foreshadows every type of stylistic change he was to make in his New York revision. In each case James tried to make his language more direct, concrete, informal, and metaphoric. This controverts the notion, once generally urged, that in revising, James ruined the clarity of his earlier prose style with circumlocution and a ponderous diction. The one pertinent fact about James's style in revision is that it conveys the increased complexity of his mature vision.

243 pages. \$3.15. Mic 56-1977

FRENCH RADIO SPEECH

(Publication No. 16,820)

Paul Pimsleur, Ph.D.
Columbia University, 1956

The Dissertation results from an experiment conducted in Paris in 1953. The experiment had two goals. The first was to continue the work done by Professor André Martinet and embodied in his book, *La Prononciation du Français contemporain*. To this end, the questionnaire designed by Professor Martinet was administered to a group of French radio announcers. The second goal was to estimate the usefulness of the questionnaire technique in phonemic research. For this purpose, recordings were made of the subjects who answered the questionnaire. Their questionnaire responses were then checked against their recorded speech.

The questionnaire contains questions bearing on each vowel sound in the French phonemic pattern, and also on certain points of interest in the consonants, such as gemination, voiced versus unvoiced consonants, etc. For each

question, Dr. Martinet's results are compared with those of this investigator. In addition, the results of the present experiment are checked against the recorded evidence whenever possible.

Chapter One of the Dissertation, the Introduction, discusses the subjects, the questionnaire, the recordings, and the techniques employed. Chapter Two deals with the vowels and Chapter Three with the consonants. The conclusions are given at the end of Chapter Three. Appendix A contains the recorded evidence used in verifying the subjects' answers.

Among the conclusions, there are some which corroborate Dr. Martinet's findings and others which show contrary results. The verification by means of recordings shows an accuracy of approximately fifty percent. It is concluded that the questionnaire technique should be subject to some control when used in linguistic research. Several possible controls are suggested.

114 pages. \$1.50. Mic 56-1978

THE DEMETRIUS-GODUNOV THEME IN THE GERMAN AND RUSSIAN DRAMA OF THE TWENTIETH CENTURY

(Publication No. 16,775)

Emanuel Salgaller, Ph.D.
New York University, 1956

Adviser: Professor Ernst Rose

The end of the sixteenth and the beginning of the seventeenth century in Russia were marked by the end of the Rurik dynasty and a succession of temporary Tsars, usurpers and outright brigand chiefs who tried vainly to maintain themselves in power. The most colorful personalities of the so-called Troubled Times in Russia were Boris Godunov, who was first a regent and then became Tsar, and one Demetrius, a man whose true identity has never been established but who stoutly maintained that he was Prince Dimitry, who had miraculously escaped the assassination attempt ordered by Boris Godunov. Eventually this Demetrius invaded Russia with a small army of adventurers, deposed Boris, and ruled Russia for almost a year.

The dramatic struggle between the two rivals for the Russian throne appealed to many dramatists, especially those of Germany. Of these, Friedrich Schiller and Friedrich Hebbel wrote plays with Demetrius as their main protagonist, but failed to complete them. Since their death, numerous attempts have been made to complete these fragments, most of the efforts being devoted to Schiller's work. The activities have been continued into the twentieth century, during which at least five attempts have been made to complete Schiller's Demetrius, of which the latest by Heinitz (1937) is the best. Only one attempt at completing Hebbel's fragment was made during the current century, namely the one by Otto Harnack (1910).

Because of the example of Schiller and Hebbel, and the attraction of the figure of Demetrius for German playwrights, numerous dramatic versions of the theme have been produced which do not derive their direct inspiration from the work of the two masters. These "independent" or

original plays really did not come into their own until the twentieth century, a circumstance which therefore marks a revival of interest in the theme among German dramatists. The variety, both in approach to the theme and in styles of writing, has been very rich. At least ten plays have been written, beginning with Paul Ernst's *Demetrios* (a pseudo-classical transformation of the subject) in 1903, and ending with Friedrich Schreyvogel's *Der Gott im Kreml* (1937). Of the other versions, the plays by Albrecht Schaeffer, Lernet-Holenia, and Henry von Heiseler (entitled *Die Kinder Godunofs*) are the most interesting.

While German playwrights as a whole showed a predilection for Demetrius, the Russian dramatists were more attracted to Boris. The unfortunate monarch who struggled in vain against a grave accusation and the adverse fate which was its consequence appealed more strongly to the Slavic concept of crime and retribution. Thus the two outstanding contributions of Russian authors to the theme, the one by A. S. Pushkin and the other by A. K. Tolstoy, were devoted to Boris Godunov.

In addition, a few plays which have Demetrius as a hero have come from the pens of Russian dramatists, the most outstanding being the one by the most prominent Russian dramatist, A. N. Ostrovsky. These plays adhere to the theory that Demetrius was an impostor, though not necessarily a base or worthless person. Towards the end of the nineteenth century the reputation of the Pretender rose in Russian eyes, and in 1904 A. S. Suvorin wrote the only play in the Russian language in which Demetrius believes to the very end that he is the son of Ivan the Terrible.

The play of Suvorin marks an interesting departure in the treatment of the Demetrius theme which has not yet been sufficiently exploited. In this direction, and in the possible restatement of Schiller's fragment on the basis of faithfulness to the original, coupled with a concentrated dramatic construction, lies any possibility for the continuation of the theme. 446 pages. \$5.58. Mic 56-1979

**A SHORT HISTORY OF THE FREEMAN,
A MAGAZINE OF THE EARLY TWENTIES,
WITH PARTICULAR ATTENTION TO
THE LITERARY CRITICISM**

(Publication No. 16,827)

Susan Jane Turner, Ph.D.
Columbia University, 1956

Chapter I deals with the founding of the *Freeman* in 1920 by Mrs. Helen Swift Neilson to express the single tax, anti-state views of her husband, Francis Neilson. I have sketched the events--cultural, personal and political--which brought the *Freeman* into being: (1) its sponsorship by a great Chicago packing fortune; (2) the origin of the magazine in the friendship of Francis Neilson, a British Liberal, and Albert Jay Nock, an American reform journalist, and their association with the single tax movement;

(3) their decision to enter the field of intellectual reviews in New York by publishing a weekly of politics and the arts; (4) the cultural renaissance which they found there; (5) the assembling of a staff including Van Wyck Brooks, B. W. Huebsch, Suzanne LaFollette, Walter Fuller, and Geroid T. Robinson; (6) their intention to imitate the format and tone of the London *Spectator* and to appeal to the liberal intelligentsia in America and abroad.

Chapter II deals with the *Freeman's* "radical" policy as formulated by Neilson and Nock and with the role of the magazine in advanced political journalism in 1920-24. I have analyzed the peculiar nature of the paper's radicalism, finding it an unusual point of view in the period and, in relation to other current modes of protest on the left which, in contrast to the *Freeman*, sanctioned political action, essentially "literary" and retrospective in character. However, for the general tenor of its social criticism--its belief in progress, its championship of civil liberties, its emphasis on a disinterested examination of facts--I have noted the *Freeman's* affinity with the whole of the liberal thought of the period. I have defined the ideological connection between the *Freeman's* political and artistic policies as a loose one, based on the conviction that politics and literature should confirm each other.

Chapter III deals with the background of the *Freeman's* literary policy in the cultural renaissance of the previous decade. I have described the beliefs of Mencken, Pound, Bourne, and Brooks and their influence on the idea of an intelligentsia and on the "social" and "aesthetic" literary criticism of the early twenties. I have then characterized the *Freeman*, as compared with the *Dial*, the *Nation*, and the *New Republic*, as the leading organ of the "social" criticism of the period.

Chapter IV deals with the activity of Van Wyck Brooks as literary editor and chief literary critic of the *Freeman*. I have described his leadership of "the young intellectuals" and his gradual separation from advanced literary opinion as the "social" criticism gave way to the "aesthetic."

Chapter V deals with other contributors to the *Freeman*, especially those who wrote on humane letters and on music, theater, painting, architecture, and sculpture. I have characterized the work of the chief reviewers in these fields: Newton Arvin, Mary Colum, John Gould Fletcher, Henry B. Fuller, Edwin Muir, Louis Untermeyer, for literature; and Daniel Gregory Mason, Walter Prichard Eaton, Lewis Mumford, Walter Pach, for the non-literary arts.

Chapter VI deals with the books reviewed in the *Freeman*, especially the treatment of the literature of the small town, non-fictional criticisms of American culture, the works of leading foreign writers, and experimental writing such as *The Waste Land* and *Ulysses*.

Chapter VII deals with the reputation of the *Freeman* in its time, the reasons for its discontinuation, and its place in the American liberal tradition. I have summarized my impressions of the quality of the magazine and asserted that it was the most eminent and representative outlet for the American intelligentsia of the very early twenties.

265 pages. \$3.45. Mic 56-1980

ON χ^2 -STATISTICS WITH VARIABLE INTERVALS

(Publication No. 16,857)

Anadi Ranjan Roy, Ph.D.
Stanford University, 1956

The χ^2 -statistic is applied to test the hypothesis that an observed random sample x_1, x_2, \dots, x_n arises from a population having an assumed probability density function (p.d.f.) $p(x|\theta)$, where θ is a parameter which may be vector-valued. The form of the classical χ^2 test is as follows: The range of variation of the random variable x is divided a priori into k non-overlapping fixed class intervals S_1, S_2, \dots, S_k . If m_i is the frequency of x_α 's, $\alpha=1, 2, \dots, n$ falling in S_i and p_i is the probability of a single observation falling in S_i , $i=1, 2, \dots, k$ derived on the basis of the p.d.f. $p(x|\theta)$ then the distribution of the statistic

$$R_n = \sum_{i=1}^k \frac{(m_i - np_i)^2}{np_i}$$

tends to the well-known χ^2_{k-1} distribution with $k-1$ degrees of freedom (d.f.) as n tends to ∞ . In the above the value of θ in $p(x|\theta)$ is known. Instead, let only the form of $p(x|\theta)$ be known but not the value of θ . Let θ be vector-valued with s ($s < k$) components $\theta_1, \theta_2, \dots, \theta_s$ and \tilde{p}_i be any best asymptotically normal limited information estimate of p_i , $i=1, 2, \dots, k$, such as minimum χ^2 or maximum likelihood estimate on limited information. (An estimate is called full or limited information estimate according as it is based on the individual sample observations x_α 's or on the class frequencies m_i 's.) Then the asymptotic distribution of \tilde{R}_n , obtained from R_n by replacing p_i by \tilde{p}_i , is that of χ^2_{k-s-1} with $k-s-1$ d.f.

Lehmann and Chernoff reconstruct the statistic R_n as follows: They calculate the maximum likelihood estimates $\hat{\theta}_j$ of θ_j , $j=1, 2, \dots, s$ based on the full information of the individual sample observations x_α 's, replace p_i in R_n by \hat{p}_i , obtained by substituting $\hat{\theta}_j$'s for θ_j 's in the expression for p_i , and show that the asymptotic distribution of

$$\hat{R}_n = \sum_{i=1}^k \frac{(m_i - n\hat{p}_i)^2}{n\hat{p}_i}$$

is that of $\chi^2_{k-s-1} + \lambda_1 z_1^2 + \lambda_2 z_2^2 + \dots + \lambda_s z_s^2$, where χ^2_{k-s-1} is a χ^2 -statistic with $k-s-1$ d.f., z_1, z_2, \dots, z_s are mutually independent normal variates with 0 mean and variance 1 and $\lambda_1, \lambda_2, \dots, \lambda_s$ are constants whose values lie between 0 and 1. The λ 's, however, depend on θ and to that extent the distribution is not known.

In all the above formulations the class intervals S_1, S_2, \dots, S_k are fixed a priori before the sample is drawn. This arbitrariness has been removed in this paper by relaxing the condition of fixedness of the intervals. The intervals S_1, S_2, \dots, S_k have been defined in terms of a suitable full information estimate $\hat{\theta}$ of θ , i.e., S_i is a function of $\hat{\theta}$, $i=1, 2, \dots, k$. Now let

$$p_i^*(\hat{\theta}) = \Pr \{x \in S_i(\hat{\theta}) | \theta = \hat{\theta}\}$$

i.e., $p_i^*(\hat{\theta})$ is the probability of an additional observation x (independent of the observed sample) falling in $S_i(\hat{\theta})$ when θ assumes the value $\hat{\theta}$ in $p(x|\theta)$. The theory of the asymptotic distribution of the statistic

$$R_n^* = \sum_{i=1}^k \frac{(m_i - np_i^*(\hat{\theta}))^2}{np_i^*(\hat{\theta})}$$

has been developed. In particular it has been shown that if $\hat{\theta}$ is the full information maximum likelihood estimate of θ then the asymptotic distribution of R_n^* is still that of $\chi^2_{k-s-1} + \lambda_1 z_1^2 + \dots + \lambda_s z_s^2$ where χ^2_{k-s-1} is a χ^2 -statistic with $k-s-1$ d.f., z_1, z_2, \dots, z_s are mutually independent normal variates with mean 0 and variance 1 and $\lambda_1, \lambda_2, \dots, \lambda_s$ are constants lying between 0 and 1, with the important difference that in some cases, such as when θ is a scale or translation parameter or a combination of both, the constant λ 's can be made to be free from their dependence on θ and thus the asymptotic distribution of R_n^* is completely known in these cases. Some important examples have been computed to demonstrate this.

55 pages. \$1.50. Mic 56-1981

ON MINIMIZING AND MAXIMIZING A CERTAIN INTEGRAL WITH STATISTICAL APPLICATIONS

(Publication No. 16,858)

Jagdish Sharan Rustagi, Ph.D.
Stanford University, 1956

The problem of minimizing and maximizing an integral of a function $\phi(x, F(x))$ where $F(x)$ is a cumulative distribution function (c.d.f.) of x , with respect to ordinary Lebesgue measure on the closed interval $[-X, X]$, over a class of admissible c.d.f.'s, has been considered. Here ϕ is defined on a closed and bounded region $S = \{(x, y) : -X \leq x \leq X, 0 \leq y \leq 1\}$ is continuous on S and is strictly convex and twice-differentiable in y and the admissible class of c.d.f.'s is the set of all c.d.f.'s defined on $[-X, X]$ having given mean and variance.

It is proved that the minimizing and maximizing c.d.f.'s exist and the minimizing c.d.f. is unique. A characterization of the minimizing c.d.f. has been given. It is shown that the maximizing c.d.f. is at most a three-point distribution.

The solution of the problem of maximizing and minimizing the expectation of the largest observation and the range of a sample n observations, where the underlying c.d.f. has given mean and variance, has been obtained as a particular case of the general result.

An example shows that the technique used is quite powerful and gives the solution to similar problems even though the side-conditions on the c.d.f.'s are not of the conventional type.

58 pages. \$1.50. Mic 56-1982

MUSIC

THE HARMONIC LAWS IN THE MADRIGALS OF CARLO GESUALDO

(Publication No. 16,774)

George Ruffin Marshall, Ph.D.
New York University, 1956

Adviser: Curt Sachs

This study of Don Carlo Gesualdo's madrigals is prefaced by a brief resume of this still controversial composer's life and quotations from a number of the criticisms, pro and contra, that have been published through the years from his death in 1613 to the present.

The main body of the work is divided into chapters that discuss in detail, and illustrate with examples from his music, the major points of Gesualdo's composition technique as revealed by the study of all the madrigals in the six books of Molinaro's famous score edition.

Because of the question raised by many writers of the role a keyboard instrument might have played in Gesualdo's composition, the madrigals were first studied from the viewpoint of both mean-tone and equal temperament. While this part of the study tells nothing of Don Carlo's alleged use of the keyboard in composition — although the absence of a keyboard idiom seems to obviate the question of improvisation — it does cast considerable light on his style. All the pieces that were written before 1600 are restricted to the "good" harmonies of a mean-tone temperament, while those published after that date lie in the freer realm of equal temperament.

The technique of analysis used in the study of the madrigals was a modification of Hindemith's system. From this analysis emerges the picture of a highly gifted artist and thoroughly trained craftsman who was in complete command of his technique from the earliest to the latest of the madrigals. Gesualdo's consistent use of certain traits of style and technique found in his six books of madrigals makes possible the deduction of the following harmonic laws.

- 1) The use of harmonic and contrapuntal material of the sixteenth century both in its conventional form and expanded by extending the traditional practices.

- 2) The clear establishment of tonalities by a stress on tonally important chord roots without employing functional harmonic progressions except at some cadences.
- 3) The use of both the Ecclesiastical modes and the major-minor system.
- 4) Chromaticism based on a few well-defined techniques that are rooted in traditional practices.
- 5) The use of cadences either to clarify or make subtle both tonality and structure.
- 6) A modulatory plan that stresses the primary key relations at important points and shows a balance of primary and secondary keys throughout each madrigal.
- 7) A control of the most intense and daring harmonies and modulations by alternating them with sections of traditional material.

The composer's use of these laws shows two distinct periods in his career. Books I through IV, with their restrictions of temperament, restrictions of harmonic daring, less unbridled use of chromaticism, clarification of harmonically ambiguous polyphonic openings, clean distinctions of modal color, and more circumspect modulations, clearly belong to the first — the classicistic — generation of the period. After 1600 there is a clear and obvious break in style. The last two books show more vigor, more freedom, wilful harmonic and modal ambiguity, and the remotest modulations. All of these were used in expression of the new anti-classicistic trend.

The study shows that while Gesualdo should be called an amateur in that he did not earn his livelihood as a composer he cannot be called by that name in any other sense. Bound to his time as the true artist must be, he reacted to the forces that changed an era. Just as this composer has had his attackers and defenders for the past three-hundred and fifty years, individual listeners will doubtless continue loving or hating this music each according to his own taste and temperament. But, partisans on both sides can reach accord on the common ground of technique and agree that this highly gifted musician and thoroughly trained craftsman, who continued to grow throughout his career, and who captured the spirit of his day in his art must be given his rightful place among the immortals of music.

211 pages. \$2.64. Mic 56-1983

PHILOSOPHY

CONCEPTS OF METHOD IN THE RENAISSANCE AND THEIR ANCIENT AND MEDIEVAL ANTECEDENTS

(Publication No. 16,809)

Neal Ward Gilbert, Ph.D.
Columbia University, 1956

Beside the discussions of scientific method at Padua and other medical schools in the Renaissance, there was a widespread discussion in European universities of method in the arts, including history, law, theology, and geometry. This movement was motivated chiefly by Humanist resistance to medieval methods of teaching and studying; it adopted for its purposes Platonic doctrines, Stoic definitions of art, and the Academic tenets of Cicero. The artistic methodology stressed the speed and efficiency of its methods, a line of thought that crystallized in innumerable short textbooks "methodically" composed, on every subject of the school curriculum.

Between this school of thought and that of the traditional Aristotelian and medical commentators there was considerable rivalry; to a certain extent they developed their doctrines in conscious opposition. Peter Ramus, for example, devoted considerable energy to attacking the methodology of Galen and his medical adherents. Opposition to Scholasticism was universal among the proponents of artistic or dialectical method. On the other hand, Aristotelians comprised two camps. One — the Averroistic — paid little attention to the criticisms of the Humanist methodologists. The other relied upon scholarly exegesis of Aristotelian texts to rebut the claims of their rivals and defend Aristotle as having the only true method.

The dissertation takes the view that it is unwise to attribute to any of the methodologists of the Renaissance a greater originality than they claimed for themselves — which was very little. The academic philosophy of the period made no claim of novelty for its doctrines of Method, but contented itself with offering interpretations of the classical texts. The determination of the sources of this controversy is therefore a necessary step in its evaluation.

Accordingly, the development of the concept of artistic method among the Greeks is traced, beginning with the Platonic dialogues and continuing into late antiquity. Socrates outlined the requirements for thorough mastery of an art. Although Aristotle's use of some of these Platonic methods is clearly visible, he established no elaborate correspondence between Plato's doctrines and his own ideas of the acquiring of scientific knowledge. However, Aristotelian commentators, many of them Platonists, often incorporated Academic or other notions into their interpretations of Aristotle. Among these was the Stoic idea of a *methodos* or short-cut to acquiring mastery of an art, which was to have great practical significance in the Renaissance. To all these ideas Galen added a few of his own, so that he became a leading authority on method.

Arab and Latin commentators owed much to their predecessors; most of their ideas on method may be derived from the admixture developed in late antiquity.

All these sources were quoted extensively in the sixteenth century and used to support two main positions: one holding to traditional Scholastic doctrine that geometry was the model for demonstrative science, and that two methods, the resolute and the compositive (the analysis and synthesis of Greek geometry, with various philosophical overtones acquired along the way) were employed in its development. The other school, while not necessarily repudiating these methods, held that their methods of acquiring or teaching the useful arts were just as significant.

Basically, then, Renaissance controversies over Method did not represent a genuine joining of issues, so much as a difference of purpose or emphasis. The medical men and Averroists were concerned with scientific or theoretical knowledge, the Humanistic methodologists with pedagogical efficiency and the usefulness of applied learning.

Extensive quotations from Renaissance sources are given, to enable the reader to appreciate the inter-relatedness of what have hitherto been regarded as sporadic or independent currents of Renaissance thought.

353 pages. \$4.55. Mic 56-1984

A THOMISTIC THEORY OF EMOTION

(Publication No. 15,405)

Journet David Kahn, Ph.D.
University of Notre Dame, 1956

Stemming originally from an interest aroused by William James' theory of emotion, this dissertation aims at a Thomistic exposition of the various soul-body unities involved in the motions of sense appetite (*passiones animales*). Preparatory to this task, the continuity of St. Thomas with Aristotle is shown, his primary meaning of *passio* is revealed and carefully distinguished from very similar sensistic phenomena (*passiones corporales*), and the dialectical and real definitions of emotion are compared. The ultimate unities are then manifested by an application of the four causes to the relations between soul and body in emotional activities.

Following Aristotle, for whom movements of sense appetite offer the most typical case of passive undergoing (*τὸ παθεῖν, πάσχειν*), St. Thomas locates the most primary meaning of *passio*, not in either immaterial or physically-grounded cognitive operations (sensation and intellection) where object is submitted to knower, but rather in those appetitive movements essentially involving physiological alteration, where the object in its total (extra-cognitive) being draws the power to itself. Among activities of the soul, then, only emotions are properly *passiones*. There are, however, certain cases of pain and pleasure (*passiones corporales*) which, while closely related to appetite, are nevertheless purely sensistic in nature, and their cognitive character excludes them from emotion as such.

The real definition of emotion at which the philosopher

of nature aims must include all physiological changes involved. The non-consideration of the latter may, however, yield a dialectical definition where, for example, anger would be considered only as a form (desire for retaliation) in abstraction from material or immaterial subject (sense appetite or will) in which it is "received." While useful at a pre-scientific level, such an abstract definition fails to attain emotion existing in physical and psychical nature.

To manifest the essentiality of the body in the real definition of emotion, the medieval theory of the role of the heart and animal spirits is briefly treated together with then current theories of specific bodily changes in such emotions as love, joy, sadness, fear and anger. But the essential role of the body must be more than empirically grounded. Metaphysical causality in the relation between matter and form is analogically present in emotion; the intimacy of hylomorphic unity, exceeding even that of sense power and organ, is realized. There is also a similitude of bodily activities in relation to psychic appetitive movement, where the latter stands as exemplar cause (in the order of activity rather than substance) in which bodily movements participate and to which they conformatively correspond (e.g., the aggressive movements of anger).

The unity of soul and body in emotion that occurs in the order of efficient causality is grounded in hylomorphic unity, since it is only as joined to organ that appetitive movement gives rise to physiological changes. The efficiency of the motion of appetite upon vis motiva involves a real relation of imperium between two vital active powers, and this relation distinguishes such efficiency from the motor-mobile relation of inanimate nature. Thus is made possible the sharing of bodily movements in the nature of instrumentality, the intentional elevation of physical nature to the level of psychic appetite and the resulting unity between instrument and principal agent.

The specification of physiological changes resulting from their teleological ordination to appetitive aims stems from the judicative and imperative character of aestimative cognition of the good, which knowledge antecedes and specifies the appetitive movement itself. It is sense appetite considered as penetrated by cognitive intention of the end (good) that alone explains formal specification of the body by appetite, the exemplarity of the latter and the instrumentality of bodily changes.

203 pages. \$2.55. Mic 56-1985

THE PHILOSOPHY OF RELIGION OF WILLIAM TEMPLE

(Publication No. 16,826)

Owen Clark Thomas, Ph.D.
Columbia University, 1956

The purpose of this dissertation is the investigation of the thought of William Temple in so far as it deals with the philosophy of religion. Temple's method in his earlier works is an alternation between philosophical and theological approaches. In his Gifford Lectures he calls his method natural theology, the investigation of the nature and validity of religion.

Temple's basic metaphysical presupposition is that the universe is a rational whole or unity. Reality exists in a

series of levels, matter, life, mind, and spirit, each of which depends on those below it and is fulfilled in that above it. Temple criticizes traditional logic as incapable of dealing with historical and individual reality and proposes a logical method which he describes as critical and dialectical. He criticizes the Cartesian and idealistic epistemologies and elaborates a critical realism in which the subject-object relation is held to be primary and irreducible to either of its elements.

Temple believes that the essential condition of value is the correspondence between mind and its environment. Value is objectively real but it is actualized only in appreciation. Value is logically prior to existence, and substance is value plus existence. Value judgments are intuitive, ultimate, and final. Rejecting idealistic solutions of the problem of negative value, Temple states that evil may be justified by the fact that it affords the occasion for higher forms of value than would be possible without it. Mind is a mode of action and reaction involving a capacity for the calculation of means to ends presented as valuable. Conscious mind presupposes experience and not vice versa. The most characteristic and distinguishing feature of mind is its capacity to form concepts or free ideas which are the basis of its free activity. Temple claims that by rejecting epistemological idealism and by affirming epistemological realism, he arrives at a position close to metaphysical idealism.

Temple holds that religious experience is the whole experience of a religious man and not simply extraordinary moments of intense awareness of God. Religious experience is universal and incommunicable. The individual's religious experience depends on his religious tradition, but the whole of tradition depends on experience. Authority is a universal and essential element in religion. Authority is not necessarily in opposition to reason or spirituality, because it appeals to reason and free acceptance. Knowledge of the personal God is gained through revelation which is the coincidence of divinely illumined mind and divinely guided event. Eternity transcends history, but history is not epiphenomenal to eternity, because history is the expression and fulfillment of eternity. History is the manifestation and working out of the eternal purpose, and the goal of history is the commonwealth of value.

Temple's argument for theism consists of four dialectical transitions beginning with the picture of the world offered by science and passing through immanent theism, transcendent theism, the soteriological dependence of finite minds upon the transcendent mind, to the necessity of an actual justification of evil in a specific revelation. This argument is a form of the cosmological argument and is an exercise in Christian apologetics.

Although Temple states that the philosophy of religion should examine the actual religions of mankind, he does very little of this. His philosophy of religion amounts to Christian apologetics or Christian philosophy. The reason for this becomes clear when it is realized that philosophy and theology are parallel enterprises. The basis of this is the fact that everyone has what functions for him as a religion. Thus, the philosophy of religion is the investigation of religion on the basis of the world-view of the philosopher.

243 pages. \$3.15. Mic 56-1986

THE EMPIRICAL EVIDENCE FOR BRIGHTMAN'S THEISTIC COSMOLOGY

(Publication No. 16,870)

Gustave Herman Todrank, Ph.D.
Boston University School of Theology, 1956

Major Professor: Dr. S. Paul Schilling

This dissertation attempts to evaluate the relationship between the empirical evidence and the resultant theistic cosmology in the philosophy of Edgar Sheffield Brightman. The first five chapters describe the essentials of that relationship. The first defines the problem. The second indicates the fundamentals in Brightman's philosophy with special reference to his method as analysis-synopsis and his criterion of truth as empirical coherence. The third elucidates his empirical scheme, defining and relating the datum self and the empirical data which together constitute an empirical whole, personality. The fourth organizes his scheme of evidence, which includes the epistemic process, the method of philosophical interpretation, the objective reference of thought, and the four realms of being essential for a cosmology — physical things, universals, values, and consciousness. Since the coherent interpretation of each of these realms suggests the existence of mind on a cosmic level, Brightman concludes that all reality is personality. The relationship between mind and body is interaction between human and Divine Mind. The fifth chapter describes his resultant theistic cosmology: nature is both phenomenal and noumenal; essentially, nature is an aspect of the activity of the Divine Personality; natural evil results from an obstacle within the Divine Consciousness, or God; hence, God should be considered Finite-Infinite; and the only realities other than God are finite personalities.

The sixth chapter attempts to discover whether or not the relationship between the empirical evidence and the resultant theistic cosmology is coherent. It recognizes that the relationship is consistent, but finds that the demands of coherence over consistency require an evaluation of the major hypotheses of the former chapters.

(1) Brightman's method of empirical analysis-synopsis is irreplaceable if both analysis and synopsis are used as interdependent. (2) His formulation of empirical coherence as the criterion of truth is irrefutable. (3) His empirical scheme is confusing in that he says on the one hand that "experience is all that we have," and that the idea cannot be compared with its object, and then on the other hand that every datum is a sign and that all experience has an objective reference. (4) The propositions that "all evidence for anything is personal consciousness," and that "the realist invents an unverifiable hypothesis with no evidence in experience" suggest that Brightman's scheme has not escaped the fallacy of argument from the egocentric predicament. (5) Brightman's interpretations of the nature of substance, the mind-body relationship, and the cause of natural evil seem incoherent with the empirical evidence. Hence, these three problems receive further examination.

The seventh chapter attempts to establish a reoriented cosmology in which the problems mentioned approach a more coherent solution through the discussion of cosmos, chaos, and consciousness. Cosmos refers to the total physical environment, the basic characteristics of which are substance and causation. To account for substance an entity called "onton" is posited as the basic constitutive element of extension. To account for causation an efficient activity called "Theon," or God, is posited as the unifying causal power that pursues a goal through the integration of the ontons into structural hierarchies.

Chaos, or disorderly change within the cosmos, involves four explaining factors: the nature of the onton limits the structural possibilities; the hierarchies tend to revert to unstructured form; some structural relations are unpredictable; and some relations, when actualized, obstruct an aspect of Theonic causation.

Consciousness is awareness, a specific biological relationship between the ontonic cellular structures of the organism.

Because Theonic causation seems to pursue a goal, teleology is primary in Theonic-ontonic cosmology. Creative well-being is considered the best criterion for Theonic purpose. The most valuable experience of creative well-being is the ineffable awareness of Theon.

331 pages. \$4.25. Mic 56-1987

PHYSICS

PHYSICS, GENERAL

I. THE MAGNETIC SUSCEPTIBILITY OF TIN AND II. FLUX TRAPPING IN IMPURE SUPERCONDUCTIVE TIN

(Publication No. 16,675)

Joseph Ignatius Budnick, Ph.D.
Rutgers University, 1956

This thesis consists of two parts. The first part deals with the construction of a sensitive electrodynamic force balance suitable for determining small magnetic

susceptibilities and its use for the measurement of the susceptibility of pure polycrystalline white tin. The balance could detect an unbalanced force of approximately .007 dynes in a total force of about 8000 dynes. The susceptibility of white tin was found to be $.0237 \times 10^{-6}$ cgs units per gram, in good agreement with the results of other investigators.

The second part of the thesis describes measurements of the effect of impurities on the trapping of flux in superconductive tin cylinders. The results show a marked increase in the amount of trapped flux within different ranges of concentration of indium, antimony, and bismuth, corresponding roughly to the same range of electronic

mean free paths, of the order of 10^{-5} cm. This agrees with Pippard's results on tin-indium mixtures, and is compatible with his theory of the cooperative nature of superconductivity, and the resulting mean free path effect on the flux trapping mechanism. 76 pages. \$1.50. Mic 56-1988

MICROWAVE SPECTRA OF OD, AND OF OH IN $\Pi_{1/2}$ STATE

(Publication No. 16,804)

George Christ Dousmanis, Ph.D.
Columbia University, 1956

The microwave spectra of OD in $\Pi_{1/2}$ and $\Pi_{3/2}$ states and those of OH in $\Pi_{1/2}$ state have been observed with a magnetic spectrometer. The lines arise from direct transitions between the two Λ -doublet levels in each rotational state of the ground vibrational level of the molecules.

Van Vleck's theory on molecular energies in $^2\Pi$ and 2E states is extended to include terms of order $(E_{\text{rot}} \text{ or } E_{\text{fs}})^2 / E_{\text{el}}^2$. The experimental results agree with theory to about one part in 2000 which is the expected order of accuracy of the latter. An improved agreement is obtained if one allows a small variation of the electronic wavefunction from one rotational state to the next. The Λ -doubling constants obtained from the experimental data are compared with those predicted from the pure precession hypothesis. The spectra include prominent magnetic hyperfine structure which gives information on the distribution of electronic angular momentum in the molecule. The theory of the hyperfine effects is re-examined. The hyperfine structure, the molecular magnetic moment and the line intensities depend strongly on intermediate coupling in agreement with theoretical expectations. The microwave spectrum can be used in studying the effects of various substances on radical concentration.

75 pages. \$1.50. Mic 56-1989

THE QUANTUM STATISTICAL DENSITY MATRIX

(Publication No. 16,788)

Joseph Erwin Willett, Ph.D.
University of Missouri, 1956

Supervisor: Dr. Bernard Goodman

As a result of some inconsistencies in the literature the problem of evaluating the density matrix with wave functions of the proper symmetry for identical particles is reconsidered. It is shown that the correct density matrix $\rho^{\pm}(x,x)$ is related to the density matrix for unsymmetrized wave functions $\rho(x,x_0)$ (i.e., the Boltzmann density matrix) by

$$\rho^{\pm}(x,x) = \frac{1}{N!} \sum_P (\pm)^P \rho(x, Px) .$$

This is applicable to a system of N identical spinless particles obeying Bose-Einstein (+) or Fermi-Dirac (-)

statistics. x is the $3N$ -dimensional configuration vector and P is a permutation of the particles. The exponent P is (even, odd) for (even, odd) permutations, respectively. The above result is less evident for Bose-Einstein statistics because the directly symmetrized wave functions are not normalized.

The problem of evaluating the density matrix reduces to that of obtaining approximate forms for the function $u(\beta) = e^{-\beta H} \phi_p(x)$. Here H is the hamiltonian operator, $\phi_p(x)$ is an unsymmetrized eigenfunction of the total momentum operator and $\beta = \frac{1}{kT}$. Three methods of evaluating $u(\beta)$ are:

(i) an expansion in powers of Planck's constant, h ,
(ii) a perturbation expansion,
and (iii) an infinite product representation.
These three methods are studied in the present work with the following results:

(i) A new and relatively easy iteration procedure is developed. $u(\beta)$ can be written as

$$u(\beta) = \sum_{j=0}^{\infty} v_j u_0 , \quad u_0 = e^{-\beta H^{cl}} \phi_p(x) .$$

H^{cl} is the classical hamiltonian and v_j is a polynomial with respect to β . The recurrence relation,

$$v_j u_0 = O \left[\frac{\hbar^2}{2m} \nabla^2 + \frac{p^2}{2m} \right] v_{j-1} u_0 ,$$

is found, where ∇^2 and p are the $3N$ -dimensional Laplacian and momentum, respectively, m is the mass of each molecule, and \hbar is the Dirac constant. The operator O performs the operation of replacing β^M in each term of the polynomial v_{j-1} by $\frac{\beta^{M+1} + 1}{m + 1}$ without altering u_0 . The h -expansion follows directly. $\rho(x,x_0)$ is expanded to fourth order in h in order to investigate the possibility of employing this expansion in a study of exchange effects and also to see if it is feasible to employ the present method in obtaining terms of higher order than those now known.

(ii) A simple and direct method of obtaining the perturbation expansion by the conventional Green's function technique is pointed out and a possible application to the exchange contribution to the second virial coefficient is discussed.

(iii) A slight modification is introduced into the infinite product representation which seems to make it more tractable.

Expressions for the quantum statistical second virial coefficient are obtained by the three methods mentioned above. In addition, a simplified step-function model of Butler and Friedman is employed to approximate the exchange effects in the second virial coefficient. The results of some preliminary calculations are discussed.

89 pages. \$1.50. Mic 56-1990

PHYSICS, METEOROLOGY

TRANSMISSION OF RADIATION THROUGH WATER VAPOR SUBJECT TO PRESSURE BROADENING IN THE REGION 4.2 MICRONS TO 23 MICRONS

(Publication No. 16,452)

Harold A. Daw, Ph.D.
University of Utah, 1956

Chairman: Walter M. Elsasser

1. HALL EFFECT INFRARED DETECTOR

Recent research in the properties of semi-conductors indicate that a thermal detector of great sensitivity and variable signal to noise ratio might be feasible. Measurements have been made on tellurium indicating that, depending on the amount of impurity in the crystal, a reversal in the Hall emf occurs with a very small temperature change. The Hall emf depends on the magnetic field applied, while the thermal noise depends on the temperature. These two properties might be combined to yield a sensitive thermal detector with low noise.

2. NON-BLACK BODY INFRARED RADIATORS

Infrared sources are primarily thermal in nature and radiate the majority of their energy in the regions where the energy is not needed. A careful theoretical study could be made to ascertain the conditions for a source to radiate energy in a controlled spectral interval only. (This is done in the case of coherent radiators, e.g. radio transmitters.)

3. ABSORPTION COEFFICIENT TRANSFORMATION

The rate at which a parcel of air warms or cools due to radiation depends on the net radiation it is gaining at all wave lengths. Often in the treatment of radiative processes one carries the complex absorption coefficient until it is convenient to integrate over frequency. In the process one may find not only the rate of warming, but also the frequencies responsible. The frequencies are of no significance to the meteorologist. The question might be raised if it is not possible to transform the absorption coefficient at the start in such a fashion as to make the ultimate problem more easily treated. This would be a remapping as distinguished from approximating the absorption coefficient.

4. BAND WINGS FOR A STATISTICAL BAND MODEL

Goody in England has recently introduced a statistical treatment for a random band. One might extend this treatment to investigate the wings of such a band and hence learn more about the shape of lines in the infrared.

5. COMPARISON OF THE ELSASSER AND GOODY BAND MODELS

Data are now available for a comparison of the Elsasser and Goody band models as applied to water vapor. The former is simpler to treat but does not so nearly approximate the water vapor spectrum as does the latter. A critical evaluation of the two models as applied to water vapor would be useful.

6. SOLAR DISTILLATION AND FEEDBACK

A recent conference held in Phoenix, Arizona, pointed up the inefficiency in current methods of solar distillation. Efficiencies of 40 per cent are being obtained. (100 per cent efficiency meaning that one gram of distilled water is being obtained for each 540 calories of radiate energy received.) An investigation of the underlying principles of thermal stills and the introduction of thermal feedback might considerably aid the future development of solar stills.

7. OPTICAL IMAGE BRIGHTNER

A number of electronic devices have been built for brightening optical images, and/or making nonvisible radiations visible. Possible use of direct image brightening by means of optical regeneration might prove feasible.

8. RELATIVISTIC MEASUREMENT OF e/m FOR ELECTRONS AND POSITRONS

The author wrote a master's thesis on the determination of e/m by a new method under the direction of Dr. Franklin S. Harris, Jr. The author is currently extending the previous investigation to elemental particles moving with relativistic velocities. Vacuum technique studies are also being made.

9. DETERMINATION OF e/mg

Gravitational attraction of elemental particles has never been measured. It is just within the realm of possibility to measure the ratio of charge to weight for electrons.

10. STUDENT LABORATORY PERFORMANCE EVALUATION

Often the methods of evaluating student performance in a laboratory weigh analytic ability far above technique ability and the ability to grasp a problem and fit experimental equipment to its solution. The author has considered a program that may help to more properly evaluate the student with exceptional laboratory dexterity who may lack some in analytic ability. This is being tried in the elementary laboratory at the New Mexico A. & MA for one of the engineering physics courses.

75 pages. \$1.50. Mic 56-1991

ATMOSPHERIC TURBULENCE CHARACTERISTICS AT BROOKHAVEN BETWEEN 23 AND 91 METERS HEIGHT

(Publication No. 16,733)

Isaac Van der Hoven, Ph.D.
The Pennsylvania State University, 1956

The purpose of the investigation is to determine the relationship between turbulence characteristics in the lower 91 m of the atmosphere and large scale parameters. The technique of power spectrum analysis is the principal statistical tool used to evaluate and describe the turbulent motion.

Results of the study fell into three categories, i.e., the

confirmation of results found earlier by other investigators, the amplification of results found by others, and results that have not as yet been recorded in the literature. Results that confirmed earlier findings were as follows: (1) At high wave numbers, i.e., above about 2 cycles/km, the vertical and horizontal spectral estimates were proportional to the square of the mean wind speed of the level in question, (2) only at low wave numbers, i.e., below about 2 cycles/km, are the vertical and horizontal spectral estimates also dependent upon the amount of short wave radiation, and (3) as short wave radiation increases, the size of the vertical eddies which make the main contribution to convection increases. Results which amplified earlier findings were as follows: (1) An increase in the amount of short wave radiation has the effect of increasing the total vertical eddy energy, (2) a gap in the spectrum of horizontal motion, which earlier was indicated to be present below about 1 cycle/km was found to exist at about .1 cycle/km, although the generality of the existence of such a gap has not yet been proved, (3) with the knowledge of the mean wind speed and the amount of short wave radiation, a good estimate can be made of the total three dimensional and total vertical eddy energy, and (4) under stable conditions the total three dimensional eddy energy decreases with height between 23 and 91 m, while under unstable conditions it increases with height from a few feet above the surface elements to between 25 and 50 m, after which it slowly decreases; the total vertical eddy energy change with height is similar, except that under unstable conditions the change is negligible. Results that have not yet been recorded are as follows: (1) Most of the eddy energy of the vertical velocity lies in a range of periods of less than 10 min, while for the horizontal velocity the major portion is contributed by eddies with periods longer than 1 hr, (2) successive vertical velocity spectra indicate that there is an interaction between the longer period convective eddy and the shorter period mechanical eddy such that eventually, after several hours, the maximum vertical eddy energy is contributed by intermediate sized eddies, (3) the shift, with increasing height, of the center of gravity of the vertical velocity spectra to lower frequencies is apparently produced by the larger importance of convective eddy energy at 91 m as opposed to 23 m, (4) indications are that there is a discrete change in horizontal eddy energy from very low to high radiation amounts, (5) the slope of the horizontal spectral curve at high frequencies was found to be proportional to the -1.64 power of the wave number, with the power having a probable error of the mean of $\pm .02$, (6) there is very little effect of height on the average high frequency slope of the horizontal velocity spectra, and (7) the estimate of the high frequency remainder which could not be measured, averaged 15% and 35% of the measurable energy when the amount of short wave radiation was greater than or less than .5 ly/min, respectively, while for the vertical eddy energy the percentages were twice as large.

VITA

Isaac Van der Hoven was born in Rotterdam, The Netherlands on July 13, 1923. He was graduated from high school in Hawthorne, N. J. in 1941. After attending Newark College of Engineering for $1\frac{1}{2}$ years he enlisted in the Army Air Corps in 1943. He received his B.S. in Meteor-

ology from The Pennsylvania State University in 1951 and his S.M. in Meteorology from the Massachusetts Institute of Technology in 1952. He was a Research Assistant, Research Associate and Fellow in Meteorology at The Pennsylvania State University from 1952 to 1955, where he was granted a Ph.D. in Meteorology in January 1956.

103 pages. \$1.50. Mic 56-1992

PHYSICS, NUCLEAR

INELASTIC AND ELASTIC SCATTERING OF 187-MEV ELECTRONS FROM SELECTED EVEN-EVEN NUCLEI

(Publication No. 16,845)

Richard Henry Helm, Ph.D.
Stanford University, 1956

A survey has been made of the differential scattering cross sections for 187-Mev electrons on the even-even nuclei $^{12}\text{Mg}^{24}$, $^{14}\text{Si}^{28}$, $^{16}\text{S}^{32}$, $^{18}\text{A}^{40}$, and $^{38}\text{Sr}^{88}$. It has been possible to separate the elastic scattering from the inelastic in all cases and to resolve the inelastic groups from specific nuclear levels for at least one level in all cases. A simple Born-approximation analysis of the elastic data yields values of the effective radii and surface thicknesses of the nuclear charge densities which (if suitably corrected for failure of the Born approximation) are in substantial agreement with the results of Hahn, Ravenhall and Hofstadter; i.e., a radius parameter (for the heavier elements) of $c \approx 1.08 A^{1/3} \times 10^{-13}$ cm (radius to half-maximum of the charge distribution) and a surface thickness of $t \approx 2.5 \times 10^{-13}$ cm (thickness from 10 to 90 percent of the maximum of the charge distribution). Phenomenological analysis of the inelastic scattering along the lines laid down by Schiff yields some tentative multipolarity assignments, and application of some results of Ravenhall yields estimates of (radiative) partial level widths; for the E2 transitions these correspond to lifetimes of $\sim 9 \times 10^{-13}$ sec (Mg 1.37 Mev) to $\sim 1.4 \times 10^{-13}$ sec (Sr 1.85 Mev). The observed strengths of the transitions are compared to those predicted by the Weisskopf theory.

81 pages. \$1.50. Mic 56-1993

THEORETICAL ASPECTS OF ELECTRON-DEUTERON SCATTERING

(Publication No. 16,849)

Vytautas Zachary Jankus, Ph.D.
Stanford University, 1956

Electrons of high energy are now available and experimental techniques are yielding results of good accuracy.¹ It is therefore of interest to examine electron-deuteron scattering theoretically in order to see what cross sections are to be expected and what new information can be gained. Previous calculations on electron-deuteron scattering have been intended mainly for processes with low momentum transfers and become inapplicable when the momentum transfer is so large that many multipoles contribute appreciably to the cross section. Thus, it is desirable to per-

form a calculation that accounts for all multipoles. Since the interaction between electron and nucleus is of electromagnetic nature, the matrix elements involved in this calculation are similar to those used in calculating the photodisintegration of the deuteron. Calculations and experimental data are plentiful in this case. The results cannot, however, be applied directly to our case since in the photoprocess we have only real (transverse) photons, while in the electrodisintegration the main contribution comes from the longitudinal part of the electromagnetic field. Moreover, the lowest-order process in photodisintegration is the absorption of the photon, so that a large momentum transfer is necessarily accompanied by a large transfer of energy. In the process of electrodisintegration a large momentum transfer often causes a much smaller transfer of energy.

In this calculation we have treated the deuteron non-relativistically while the electron is considered to be extremely relativistic. Also, since the charge of the deuteron is small, we have used the first Born approximation. The neutron-proton interaction potential and the wave functions have been chosen to be consistent with experimental information so far as the scattering lengths and effective ranges are concerned. The mesonic effects have been accounted for in the light of Foldy's² phenomenological theory.

It has been found that the finite size of the nucleons produces a major influence upon the cross sections, while the exchange moments are rather small for a moderate energy of disintegration. Also the elastic cross section has been found to be somewhat sensitive to the presence or absence of a hard core in the neutron-proton interaction. The inelastic cross section is somewhat sensitive to the presence or absence of neutron-proton interaction in the ³P states (i.e., assumption of Wigner or Serber forces).

97 pages. \$1.50. Mic 56-1994

1. J. A. McIntyre and R. Hofstadter, Phys. Rev. 98, 158 (1955).

2. L. L. Foldy, Phys. Rev. 92, 178 (1953).

ANGULAR DISTRIBUTIONS OF DEUTERONS RESULTING FROM BOMBARDMENT OF LIGHT ELEMENTS WITH 18 MEV PROTONS

(Publication No. 13,724)

Junius B. Reynolds, Ph.D.
Princeton University, 1955

Angular distributions of deuteron groups resulting from the bombardment of various elements with ~ 18 Mev protons were observed. The deuteron detection apparatus employed a thin NaI (Tl) crystal in a scintillation spectrometer. Proper choice of the range of particles entering the crystal (as determined by a variable Al absorber in front of the crystal) enabled the desired deuteron group to be separated from other deuterons and protons. The Al absorber was so chosen that the range in NaI of the desired deuteron group upon entering the crystal was equal to the crystal thickness. With this absorber choice deuterons of the desired group gave pulses in the spectrometer which were higher than those from any proton group entering the crystal or from any undesired deuteron group. The desired deuterons could thus be identified and counted.

It was found possible to fit the observed angular distributions of deuterons from the reactions $X(p,d)Y$ with theoretical (Butler) curves calculated for the inverse reactions $Y(d,p)X$. Angular distributions were observed for reactions leading to the following final nuclei: Be⁸, B⁹, B^{9*} (2.4 Mev), B¹⁰, F¹⁸, Al²⁶. In all cases except F¹⁸ and Al²⁶, the angular momentum, l_n , carried away from the target nucleus by the pickup neutron was unity. For F¹⁸ and Al²⁶ $l_n = 0$ and 2 respectively. From these results it can be concluded that X and Y have opposite parity for all of the above reactions except the last two for which X and Y have the same parity. The determinations of l_n listed above permit limits to be placed on possible spins of the nuclear levels involved in a given reaction. These limits are given and their significance is discussed.

Absolute differential cross-sections were determined for some of the reactions studied and are as follows:

Target Nucleus	θ CM	Diff. Cross-section ($\frac{\text{mb}}{\text{ster.}}$)
Be ⁹	23°	11.1
F ¹⁹	11°	9.7
Al ²⁷	32°	1.9

Features of the individual angular distributions are discussed. 125 pages. \$1.70. Mic 56-1995

O⁺ → O⁺ TRANSITIONS IN O¹⁶ AND C¹²

(Publication No. 16,860)

Benjamin Francis Sherman, Jr., Ph.D.
Stanford University, 1956

The oscillations of a two-fluid model of the nucleus are calculated. The system is quantized, and the electric monopole transition matrix element calculated in O¹⁶. The result is found to be identical with that for a single elastic fluid since in the lowest mode of monopole oscillation the two fluids act as one. The result is close to those of other collective models, all of which are too large to agree with experiment. An unsuccessful attempt is made to include Coulomb forces in the two-fluid model.

The monopole transition matrix element in C¹² is then calculated on the basis of a shell model and found to vanish in all stages of intermediate coupling if only the (1p)⁸ configuration is involved. States of the configuration (1p)⁷(2p) are admixed in the L-S limit by treating the residual internucleon interaction as a perturbation. The spin-orbit interaction is then treated as an additional perturbation to obtain a finite result for the monopole transition matrix element. The validity of the perturbation treatment is doubtful because of the strength of the residual internucleon interaction. The interaction is diagonalized for a limited number of states in an attempt to match experimental results for the energy separation of the ground and first excited O⁺ state and for the monopole transition matrix element. The results are unsatisfactory. It is concluded that if all the possible states of the low-lying configurations are included in the diagonalization, agreement with experiment might result, but that it would be better to apply some semi-collective model to the problem.

56 pages. \$1.50. Mic 56-1996

A MODEL FOR THE NUCLEON-NUCLEUS INTERACTION

(Publication No. 16,794)

Erich Vogt, Ph.D.
Princeton University, 1955

In the work of Lane, Thomas, and Wigner the excited states of nuclei were considered to have a behavior intermediate between the behavior of the states of the independent particle model and the states of the uniform model. This work is generalized by introducing a variable amount of nucleon-core polarization into the first order wave functions — that is, into the single particle states of the independent particle model. This polarization is brought about by including a part of the actual nucleon-core potential in the definition of the core wave functions. The first order wave functions are mixed by a configuration interaction due to the difference between the remainder of the actual nucleon-core potential and the average potential acting on the extra nucleon. The assumption that the mixing of each first order state takes place into a small neighborhood near the initial energy of the state forms the basis of our model. The reduced widths are defined and the giant resonance behavior of the average reduced widths is a consequence of our basic assumption. The energy moments of the strength function (the average reduced width divided by the average level spacing) are calculated. The role played by the strength function in describing

average cross sections is described. The cloudy crystal ball model is equivalent to the choice of a particular form of the strength function. The strength functions obtained by averaging reduced widths, $\gamma_{\lambda c}^2$, over the levels of the compound nucleus, λ , are compared to the strength functions obtained by averaging the reduced widths over the channels, c , of a particular nucleon, residual-nucleus pair. The relation of the form of the strength function to the energy moments of the strength function is derived. In particular, it is shown that the square root of the second moment, M_2 , of the strength function may be approximately equal to the full width at half maximum of the strength function. The second moment is calculated to be the expectation value, taken in one of our first order states, of the square of the difference between the configuration mixing potential and a few kinetic energy terms arising from the nucleon-core polarization. This expectation value is evaluated roughly. It is found that the large value of M_2 obtained by Lane, Thomas, and Wigner ($\sim 20 \text{ Mev}$)² can be reduced no more than by a factor of about three. The minimum value of M_2 corresponds to including slightly less than half of the nucleon-core potential in the definition of the first order core states. Four special forms of the strength function and their effect on average total cross sections are compared. The extent to which the data on scattering lengths, level spacings and reduced widths agrees with our model is discussed.

113 pages. \$1.45. Mic 56-1997

PHYSIOLOGY

MECHANICAL AND CONTRACTILE PROPERTIES OF SURFACE-SPREAD ACTOMYOSIN FIBERS

(Publication No. 16,815)

Rosalie Joseph, Ph.D.
Columbia University, 1953

Isometric tension studies on surface-spread actomyosin fibers were made with a lever especially constructed for measuring very small tensions. They indicate that these fibers exhibit many of the important properties of whole muscle, including contraction, quick-release recovery, relaxation, and length-tension relationships. These fibers are considered to be a plausible model in regard to both organization and composition, of the contractile material of the muscle fibril. Evidence is presented to substantiate the hypothesis that this organization involves contractile elements in series with non-ATP-sensitive elastic elements. Activation of the contractile elements by ATP involves a stretching of the elastic elements which, in sum, is about 5% or less of the original length of the fiber. It is this shortening which is responsible for the tension developed in isometric contraction.

70 pages. \$1.50. Mic 56-1998

A GENETIC AND PHYSIOLOGIC STUDY OF SOME ASPECTS OF THE CHICK THYROID GLAND AND OF THE RESISTANCE OF YOUNG CHICKENS TO CONDITIONS OF STRESS

(Publication No. 16,640)

Mahmoud Abdou Kheir El Din, Ph.D.
University of Maryland, 1955

Supervisor: Dr. C. S. Shaffner

Some phases of the thyroid activity and of the resistance of young New Hampshire chickens to stress were studied. A marked decrease in growth was observed when protamone was fed at the levels of 60 and 120 grams per 100 pounds of feed. When 60 grams protamone was fed a significant interaction was noticed between the treatment and the genotype. This interaction was lacking when 120 grams of protamone was used.

The thyroxin secretion rate was estimated at two and four weeks of age. It ranged from 1.8 to 2.9 and from 3.88 to 5.0 gamma d,L-thyroxin per day at two and four weeks respectively. The amount of thyroxin needed to maintain normal body weight was less than the estimated actual secretion rate.

The estimated thyroxin secretion tended to be slightly higher for a line showing a low thyroid response to thiouracil than for a line showing high response.

Progesterone administration seemed to increase the requirement for thyroxin. A strain of flightless birds

responded more to the treatment than did normal New Hampshires. This was thought to be due to the hybrid vigor in the flightless birds.

Dimethyl ether of diethylstilbestrol seemed to exert no effect, when injected, judging by the response of the oviduct.

Diethylstilbestrol caused a pronounced enlargement of the oviduct. Thiouracil augmented the effect of estrogen on the oviduct. The estrogen used did not have any appreciable effect on thyroxin secretion rate.

Birds injected with testosterone propionate tended to have a slightly higher thyroxin secretion rate than the control. Thiouracil did not depress growth rates in this trial.

The level of thyroxin needed to maintain normal body weight might not be the same as the level needed to obtain maximum growth.

The response of the comb to testosterone appeared to depend, to a certain extent, on the thyroxin secretion level.

It was observed in all the trials where thyroxin secretion rate was estimated, that there was a consistent abnormal mortality after the second or third thyroxin injection.

The response of chickens to temperature stress and the effect of various treatments in altering that response was studied.

Heat depressed growth markedly while the low temperature used seemed to increase body weight over the controls. One hundred per cent mortality was noticed in progesterone treated birds reared under 115°F.

Thiouracil increased mortality in cold.

Penicillin, protamone, and testosterone seemed to enhance the resistance of birds to stress.

Protamone decreased size of pituitary and thyroid but it increased the weight of lymphatic organs.

Penicillin and thiouracil increased pituitary weight. Moreover penicillin increased the weights of spleen and bursa of Fabricius.

A marked atrophy of adrenal was observed due to heat treatment or/and cortisone and progesterone administration. Temperature stress and testosterone decreased weight of lymphatic organs.

Heritability estimates were obtained for body gain, gland, and organ weights. These estimates were high except for the pituitary. The reliability of such estimates is questionable because of the small number of birds used. More work is needed on some of the previously mentioned aspects.

329 pages. \$4.15. Mic 56-1999

THE NUTRITION OF THE SILVERFISH
CTENOLEPISMA LINEATA, WITH SPECIAL
REFERENCE TO CELLULOSE DIGESTION

(Publication No. 16,851)

Reuben Lasker, Ph.D.
Stanford University, 1956

In spite of the abundance of cellulose and the easy assimilation of its sub-unit glucose, the majority of animals which feed on it are unable to digest it. The work on cellulose digestion in animals is hampered by the fact that it is difficult to define the role of microorganisms. Cellulose-digesting microorganisms have been found previously in the gut of some woodboring beetles and have thus been implicated in the digestion of wood.

The silverfish is an avid consumer of cellulose, particularly paper. It was of interest to determine whether this animal could truly digest cellulose and if symbiotic microorganisms were responsible for this digestion. In addition, since the food of this insect is low in nitrogen content an investigation was also made of its nitrogen utilization.

Indirect evidence of cellulose digestion was obtained by a study of respiratory quotients (R.Q.) of silverfish. When fed cellulose the R.Q. ranged around 0.9-1.0, while on gelatin the R.Q. was 0.75. This showed that both cellulose and protein are used by the animal. By following the changes in weight of individual animals it was determined that those fed cellulose could gain weight for some weeks after the start of feeding. Digestibility coefficients were determined and showed that the silverfish could remove about 75-85% of the cellulose from its diet. This is comparable to the efficiency attained by the cow on a diet of dried grass (72%).

More conclusive evidence for cellulose digestion was obtained by feeding adult silverfish radioactive cellulose marked with C^{14} . The CO_2 respired by these animals was radioactive. Incorporation of the products of digestion was shown by the radioactivity of dried silverfish tissue after feeding the animal with radioactive cellulose.

Exhaustive microbiological studies of silverfish intestinal microorganisms showed no significant cellulose-digesting flora or fauna. Anaerobic conditions were also found to be inhibitory to most silverfish intestinal organisms. Intracellular symbiotic microorganisms were looked for by standard methods but were not found.

Bacteria-free silverfish were obtained by washing the eggs in a solution containing mercuric chloride and ethanol. After the nymphs hatched they were fed radioactive cellulose and the respiratory CO_2 was found to be radioactive. Hence silverfish without alimentary microorganisms digest cellulose.

Chemical tests for a cellulase, cellobiase and amylase were performed. These enzymes were localized in the midgut of the animal. Optimal pH activity was at 4.0 and 6.0 for the cellulase and at 4.5 and 6.1 for the cellobiase. Ammonium sulfate fractionation was used to obtain a more active cellulase preparation. The 60 and 70% saturated fractions contained almost all the cellulase.

On a complete diet silverfish may gain from 0.25 to 0.67 milligrams in weight per week. When an animal has been starved for a source of nitrogen (i.e. when fed a diet of pure cellulose) and is then fed a complete diet, its conversion efficiency of nitrogen to tissue may be high (0.014 mg. N/mg. live weight) and after a period of time may drop

(0.13 mg. N/mg. live weight). These animals conserve nitrogen by excreting less when fed a diet of cellulose, although the amount of nitrogen per weight of feces remains constant. Silverfish may lose up to 20% of their total body nitrogen before expiring.

The silverfish *C. lineata* has been shown to digest cellulose with high efficiency. Symbiotic microorganisms are not responsible for this digestion. A cellulase is present in the tissues of the midgut where a cellobiase and amylase are also elaborated. Silverfish may survive for a long time on a diet of cellulose alone but require a nitrogen source to resume active growth and metabolism. On a nitrogen-deficient diet these animals conserve what nitrogen they have by excreting less.

146 pages. \$1.95. Mic 56-2000

A COMPARATIVE STUDY OF THE ADAPTIVE
MECHANISMS IN BIOLOGICAL RESISTANCE
TO STRESS

(Publication No. 16,773)

Joseph Michael McKenna, Ph.D.
New York University, 1956

Adviser: Dr. Benjamin W. Zweifach

The work described in this report is an experimental investigation of the fundamental biological mechanisms involved in the response of animals to stress.

Three varieties of stress were applied to rats, either singly or in combination, namely, drum-shock (Noble and Collip '42), total body X-radiation and massive cortisone dosage. The responses of the animals were examined by the criteria of survival, pathological effects and leucocyte reactions.

The mechanism of traumatic shock was analyzed through the interplay of predisposing and protective factors. Factors found to be predisposing were X-radiation, reticulo-endothelial blockade and massive cortisone dosage. Protective factors were certain drugs, particularly chlorpromazine ("Thorazine", SKF), and the physiological adaptation or "resistance" to shock induced by a "training" process of repeated exposure to sub-lethal amounts of drum-trauma (Noble '43).

The mechanisms of both these protective factors were investigated, and in the case of the protective drugs, it was found that no one drug protected against all three types of stress; that their protective action could not be correlated with known pharmacologic activities, and that they afforded their protection probably through some effect on cellular metabolism. Special studies on the drug, chlorpromazine, showed that it must be injected prior to drum-shock to be effective and that it does not protect adrenalectomized rats against drum-trauma.

In the case of trauma "resistance", the following findings were made regarding its biological mechanism.

(a) "Resistant" rats retained their "resistance" against drum-trauma despite total body X-radiation and massive cortisone dosage, but lost their "resistance" following blockade of the R-E system with several agents.

(b) The "training" process induces a persistent

leucocytosis and a characteristic neutrophilic response to drum-trauma.

(c) "Resistance" against drum-shock does not protect also against the immediate lethal effects of X-radiation, but may prolong the life of animals that survive its immediate injurious effects.

(d) Acquired "resistance" to the harmful effects of meningococcus endotoxin does not donate "resistance" also against drum-shock.

Comparative studies on the leucocyte response of normal and "resistant" rats to the three types of stress showed that it was qualitatively the same in the case of X-radiation and massive cortisone dosage, though somewhat mitigated in the "resistant" rats. In the case of the leucocyte response to drum-shock, it was found different, both qualitatively and quantitatively, in "resistant" rats from the response of normal rats. The "resistant" rats, following drum-trauma, showed little change in total white cell count, a lymphopenia, marked neutrophilia and a slight eosinophilia. The normal rats responded to drum-trauma with a leucocytosis, lymphocytosis, neutrophilia and an eosinophilia.

The experimental data indicate that there are specific differences between the biological mechanisms of defense to different types of stress; that cellular and metabolic responses are involved in the defenses against stress and that possible factors in the development of the "resistant" state include some blunting of the normal response to pituitary discharge of ACTH, and an antigen-antibody mechanism against toxins that may be released as a result of trauma.

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Noble, R. L.: 1943, "The Development of Resistance by Rats and Guinea Pigs to Amounts of Trauma Usually Fatal", *Am. J. Physiol.*, 138: 346
113 pages. \$1.41. Mic 56-2001

THE SEX DIFFERENCE IN BLOOD PRESSURE OF CHICKENS

(Publication No. 16,688)

Robert Kosel Ringer, Ph.D.
Rutgers University, 1955

The adult chicken exhibits a sex difference in blood pressure of a greater magnitude, to this author's knowledge, than exists in any other species. This study concerns the establishment of the age when the sex difference in blood pressure is manifested, and an investigation of the controlling mechanism of this blood pressure difference. Also included are studies of blood pressure of the duck and pigeon. Blood pressure measurements are made both directly and indirectly.

Prior to 8 weeks of age there is no sex difference in blood pressure of the chick. At 12 to 17 weeks of age,

depending upon the season of the hatch and method of rearing, the blood pressure of the male rises markedly while that of the female remains at the chick level. The rise is abrupt and maximal in a four-week period.

There is no sex difference in blood pressure in the adult duck or pigeon indicating that the chicken's blood pressure pattern is probably not typical of Aves. Heart rates are also not different between the sexes in the duck and pigeon as they are in the chicken where the female has a higher rate.

To study the influence of endogenous gonadal hormones on blood pressure, male and female chicks were gonadectomized when 16-17 days old. The systolic blood pressure of the gonadectomized males and females at maturity was approximately that of the control male but significantly higher than the female. There was a lag of about 4 weeks in the development of the pressure rise in the gonadectomized birds as compared to the normal male.

The results of gonadectomy indicate that androgen is not responsible for the rise in pressure of the male. The data on the ovariectomized female suggest that estrogen depresses blood pressure in the female. Administration of an estrogenic substance, diethylstilbestrol or estradiol, depressed blood pressure of the male, capon, and poulard to the level of the female but did not alter the pressure of the female.

Exogenous gonadotrophins (pregnant mare serum) when injected into males and capons, whose blood pressure was depressed by estrogen, increased systolic pressure significantly. However, gonadotrophins to females or to poulards depressed by exogenous estrogen did not influence pressure. These findings suggest a variation in utilization of gonadotrophins between the male and female in controlling blood pressure. Further substantiation of this assumption was obtained from experiments with 2-amino, 5-nitrothiazole, a non-estrogenic drug which suppresses the output of pituitary gonadotrophins. This drug when fed to chickens depressed the blood pressure of the male, capon, and poulard but did not influence the female.

Exogenous gonadotrophin administration to sexually immature chicks (7-9 weeks old) did not increase blood pressure of males, capons, poulards or females even though sexual development was accelerated.

Data presented suggest that at the proper chronological age a maturation of the blood vessels or centers controlling these vessels results in an alteration of the peripheral resistance and distensibility of these vessels. This alteration may account for the rise in blood pressure of the male. The presence of gonadotrophins is not the sole mechanism responsible for this maturation. In the female this maturation is apparently inhibited by the presence of endogenous estrogen. 93 pages. \$1.50. Mic 56-2002

STUDIES ON THE MECHANISM OF THE COUGH REFLEX

(Publication No. 16,647)

Robert James Weir, Jr., Ph.D.
University of Maryland, 1956

Supervisor: Dr. Norman E. Phillips

The purpose of this research was to study the neurology, pharmacologic and mechanical dynamics of cough in dogs.

The cough, produced by stimulation of the respiratory mucosa, the vagus nerve and branches of the vagus nerve, showed these structures to be the afferent pathway of the cough reflex. Cough was blocked to stimulation of the tracheal mucosa by abolition of these pathways thus conclusively demonstrating the afferent pathway for the cough reflex.

Through threshold studies on the airway, a gradient to stimulation of the cough response was demonstrated. The carina and epiglottis were the most sensitive areas of the airway. An area 4 inches above the carina and the area of the secondary bronchi were the least sensitive. The vagus nerve was approximately 3 times more sensitive than the carina or epiglottis.

Pharmacological studies showed that the cough response was blocked by autonomic depressants (parasympa-

tholytic and sympatholytic), central nervous system depressants and analgesics. From the site of action of these materials it was shown that the cough reflex could be blocked at the level of the brain, chord, ganglia (parasympathetic and sympathetic), myoneural junction and effector organs.

A new method for screening antitussive agents is described and favorably compared with the method of Stefko and Benson.

The studies on the cough dynamics indicated that the functional presence of the glottis was not a necessary adjunct to the cough response, but that the high intrathoracic pressure of the cough resulted from the amplitude and rapidity of response of the respiratory musculature.

Cough was found to be a modification of normal respiration.

72 pages. \$1.50. Mic 56-2003

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

THE LATIN AMERICAN SOCIAL REVOLUTION AND THE ROLE OF THE MILITARY CAESAR: A CASE STUDY OF COLOMBIA, 1930-1955

(Publication No. 16,508)

Vernon Lee Fluharty, Ph.D.
University of Pittsburgh, 1956

An analysis of the social, economic and political trends in Colombia between 1930 and 1955 was undertaken to determine what forces brought on the civil war of 1948-1953, which, in turn, was ended by the intervention of a military government under General Gustavo Rojas Pinilla.

A synthesis of the broad currents of the society indicated that during a long period of time when Colombia was hailed as a "democratic" nation, the society actually was suffering from great social and economic inequities which created a deep, if latent, social revolutionary urge in the masses of the people. This urge had been kept in check by the action of the upper class oligarchs of both parties, who, in times of popular agitation, joined forces across party lines to defeat reform. As a result, the political parties, Liberals as well as Conservatives, had become not instruments for the advancement of the whole society, but for the maintenance of the privileged position of the white, rich, ruling oligarchies.

During the 30's, certain basic reforms made by the Liberals helped the masses, but also set in motion a strong counter-revolution which culminated in the dictatorship of Laureano Gomez in 1951. In the meantime, the long-thwarted desire for change was supplemented by the new demands stemming from a world awakening of the masses, by a clamoring for higher status, and by an impatience to achieve the "better world" which had seemed to be promised by Allied victory in World War II. Consequently, the masses of Colombia, in the nation's first revolution "from the bottom up," fought back fiercely and tenaciously against

the counter-reform. After five years of costly, bloody strife, the Army stepped in to halt national suicide.

Essentially, then, it appeared that Rojas Pinilla had been called up to power by events: the weakness of Colombian "democracy"; the failure of the upper classes to permit national integration on all levels; the existence of a great, violence-producing gulf between the small minority at the top and the submerged mass majority; and, basically, the utter failure of the two traditional parties to direct the society toward orderly, necessary change aimed at revising the nation's institutions.

Rojas' role, therefore, seemed to be that of a transition leader, one who could enforce the required change leading from the old order to the new, who could lay down the bases for collective living demanded in the modern world. Great obstacles stood in his way: individualism amounting to a national fetish; deep class and caste prejudices; the enshrinement of private interests as preferable to the general welfare; the view of the political parties that government is an objective to be conquered, invaded, and used as economic booty for the welfare of class and partisan interests alone.

Rojas has emphasized government for the welfare of all the people, but has governed in practice with mass considerations foremost. This has aroused strong opposition among the oligarchs of both parties, who want power returned to them. To achieve this, they have formed a Civil Front of opposition. Yet the masses of people appear to support Rojas, although that support is not organized. Hence, the power structure seems to be, Rojas, the Armed Forces, and the People against the powerful social, economic, and directive elements.

But regardless of how this structure may shift, possibly even pushing Rojas from power, still he has made a major contribution. By governing for the masses, he has given them a sense of personal dignity and importance. No future government will be able for long to turn the clock back on the commoners. And as they grow into the new concept of their importance, they will demand and get the substantive

democracy which is the only base upon which procedural democracy may grow. Thus, the military dictator makes his contribution to the future of Colombian democracy.

374 pages. \$4.70. Mic 56-2004

THE LOG CABIN SYMBOL IN AMERICAN PRESIDENTIAL POLITICS

(Publication No. 16,807)

Jacob Hansel Freid, Ph.D.
Columbia University, 1956

Because of the important influence of the symbol process in the practices of politics; of politics in the role of government; and of the role of government in our lives -- educators for democracy in America must understand the bases of the appeals to the American people which are so influential in our national politics. This essay is an historical case study of a warm, affective American fetish, the log cabin symbol. Its uses in American presidential politics from Andrew Jackson's time to that of Franklin Delano Roosevelt and Harry Truman are here presented as a particular instance of the devious use of symbols generally in the intricate formation of American public opinion. Awareness of and insight into the symbol process is fundamental to the education of intelligent citizens who can democratically cope with America's domestic and international problems and policies in a crisis time.

The successful political appeals in America have been those which take on warm associations within our home-grown traditions and aspirations. The study of the presidential candidate's requirement of availability, and frontier life and beliefs in this essay are basic in this regard. For you can hardly understand a culture's significant symbols and their political power except as you understand the social framework within which they have come to have their meaning. Against this background the log cabin symbol is seen to be the great archetype of a significant presidential symbol from American history.

In the campaigns of Andrew Jackson and Abraham Lincoln the log cabin was an authentic symbol. For in "Old Hickory" and "The Railsplitter" were represented the ideals, the hopes, the personification of the masses of American people in uncommon men of common origin. It was a spurious disguise of aristocratic Whigs who used it as a successful fiction in the "Tippecanoe and Tyler Too" log cabin campaign of 1840. But whether fact or fiction, the log cabin symbol was used for its emotional power to concentrate affection upon candidates in the place of focusing thought upon the issues. Throughout our political history this wholly American emblem remained a peculiarly native phenomenon, actively present in conventions and campaigns as part of America's tradition, frontier sage, and its equalitarian social, economic and political attitudes and aspirations.

Alfred Emanuel Smith, candidate of the Democratic party in 1928 against Herbert Hoover, was an urbanizing society's tenement-alley equivalent of the rural log cabin. As more and more Americans came to live in cities, the slum habitat came to represent the new log cabin, and Brown Derby Al Smith of the Fulton Fish Market was its latter day Lincoln.

Franklin Delano Roosevelt was the foster-son of the log cabin. Ostracized by his class and by his Groton and Harvard classes, he was adopted as the hero of the common man and their champion against the Liberty League and the economic royalists. For one can enter the American log cabin split-rail gates of political heaven by prayer, penitence and good deeds. Also Mr. Roosevelt's infantile paralysis infirmity was a physical equivalent of the handicap of birth on the wrong side of the tracks, and his uphill fight recapitulated the American underdog role of personal victory in the battle against odds.

Harry Truman's victory in 1948 was further proof that you cannot tell the average American that an average American ("Hi Harry!") is unfit to be his candidate. The polls and political analysts misunderstood the significance of Truman's log cabin identification in winning votes.

A propaganda analysis of American presidential campaigns shows why and how symbols have been and can be employed in merchandising candidates into the White House, not for what they espouse, but for what they symbolize.

The conclusions present a program of education for the understanding of the use of symbols in politics and of the techniques by which creative political artists combine technical skills in manipulating symbols with inspiration in the management of human responses.

It is only then that a voter can opt like an intelligent citizen in a democracy, instead of like a hypnotized animal.

289 pages. \$3.85. Mic 56-2005

COMMUNIST TACTICS IN HUNGARY BETWEEN JUNE 1944 AND JUNE 1947 (AN ANALYSIS AND APPRAISAL)

(Publication No. 16,770)

Peter Horvath, Ph.D.
New York University, 1956

Adviser: Roman Michalowski

Since the liberation of Hungary in 1944, the Hungarian Communists aimed at the establishment of a Communist dictatorship. This they achieved by taking advantage of the weaknesses of their political opponents whom they were to slice up gradually by using deception, intimidation, bribery and threats. The presence of the Red Army on Hungarian soil helped their devices since the Hungarian Communist Party was always able to rely on its help when challenged by Hungarian anti-Communist elements. The Hungarian Communists were also able to profit by the advantages which were offered to Soviet Russia due to developments on the international scene.

In pursuing their aims, the Communists' tactics consisted at first in drawing the Social Democratic Party into an alliance, based on the Charter of Unity, and an agreement to bring the Trade Unions under joint Communist-Social Democratic control, but, actually, under Communist leadership.

As a later step, they brought about the establishment of a coalition government with the participation of political parties of the Hungarian National Independence Front, an

alliance of the Communist, Social Democratic, National Peasant, and Smallholders Parties.

The establishment of the Leftist Block within the coalition was a further development along the lines of Communist policies since through the Block they were able to control the policies of the coalition.

Communist tactics in their inter-party relations consisted in supporting the left wings in each of the coalition parties, while conducting at the same time a strong campaign of vilifications against the rightist elements of these parties. Thus, the campaign against Fascists gradually was turned into an assault against reactionaries whom the Communists traced everywhere, especially in the ranks of the Smallholders Party.

In implementing their policies, the Communists were helped by the political police and the people's courts, both these instruments being completely controlled by 1947, by the Communists. Another device which helped their tactics was the engineering of a series of crises which reached its peak with the implied Great Conspiracy and the resignation of Ferenc Nagy, the Prime Minister of the coalition government.

To conclude: All available evidence seems to confirm the contention that the Communist aims in Hungary were firmly established as early as in 1944, and that a complete sovietization of Hungary was their ultimate objective.

However, their tactics were not rigid. In fact, they were realistically conceived and remarkably flexible.

Thus, the Communists took note of a definite revival in Hungary of democratic ideas immediately after liberation. Therefore they professed to take the lead in the democratic drive and to be the real leaders and supreme authority in implementing democracy in Hungary. At the same time, they were careful to take advantage of every opportunity which was offered to them by developments on the international scene. The Red Army in Hungary was always ready to enter the political stage whenever the objectives of the Hungarian Communists were challenged by the non-Communist majority. The democratic forces in Hungary who were opposing the onrush of Communism were, however, already since 1944, infiltrated by Communist stooges. This inherent weakness was aggravated by the lack of forceful leadership and by opportunistic policies of the individual leading political figures. Adding to these internal circumstances, the Communists were helped by the rather ineffective attitude of the Western Powers who did not feel obliged or were unable to assist effectively the Hungarian democratic elements.

387 pages. \$4.84. Mic 56-2006

UNITED STATES PUBLIC AFFAIRS ACTIVITIES IN GERMANY, 1945-1955

(Publication No. 16,814)

Howard Wright Johnston, Ph.D.
Columbia University, 1956

United States public affairs activities in postwar Germany are described, analyzed, and evaluated. The work of the United States Government in attempting to democratize and reeducate Germans is explored in terms of the social and political forces operating during the occupation

period. The shift away from reeducation to a program of persuasion and assistance is traced in detail. Although there is frequent reference to the work of the other three occupying powers, attention is centered on the public affairs activities of the United States. Separate chapters are devoted to information media (including press, radio, and films), cultural and intellectual activities, formal education, religious affairs, community affairs, and the exchange of persons. Special attention is given to the Amerika Haus program and to youth activities. The contributions of private American organizations are noted. Consideration is given to the ways in which the various programs presented the American picture in Germany and to the ways in which ties of mutual understanding were strengthened or weakened during the postwar period.

It is the thesis of the study that United States public affairs activities in postwar Germany contributed on the whole to the development of liberal democracy in West Germany and to the strengthening of ties between Germany and America. Moreover, it is maintained that a reasonably faithful picture of the United States was presented to a great number of Germans.

The United States public affairs program in a sovereign Germany after 1955 is seen as the continuation of many public affairs activities which were begun during the postwar period. The study points out the value of an uninterrupted, long-term, reciprocal public affairs program in building ties of constructive mutual relationship between the people of Germany and the people of the United States.

341 pages. \$4.40. Mic 56-2007

POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

A CRITICAL ANALYSIS OF TURKISH PARTICIPATION IN THE UNITED NATIONS

(Publication No. 16,767)

Mehmet Gonlubol, Ph.D.
New York University, 1956

Adviser: Clyde Eagleton

The United Nations is a tool created by the governments to serve them in their efforts to establish and maintain peace, and is in no way an end in itself. The decision of Member states as to whether to use this tool in any given situation, or to resort to other means of procedure, therefore, indicates the support given by that government toward achieving the aims of the Charter.

By virtue of its participation in the San Francisco Conference for drafting the Charter in 1945, Turkey became an original Member of the Organization. At the Conference, as a smaller and weaker nation, Turkey was most concerned with the limitation of the powers of the Security Council and extension of the powers of the more representative General Assembly. It supported the principle of the sovereign equality of states and the collective security provisions of the Charter, objected to the Great Power unanimity rule in the Security Council, favored the referring

of questions involving domestic jurisdiction and other legal questions to the International Court of Justice, and accepted, with minor reservations, the compulsory jurisdiction of the Court over legal disputes.

During the first eight years of the activities of the Organization, Turkey has shown an active interest in most disputes which have come before the bodies of the United Nations, although not in the same degree as some other nations. It preferred to refer legal disputes to the Court and abided with the resolutions of the United Nations for the settlement of disputes.

The most active interest of Turkey, however, was gathered around the collective security activities of the Organization. Thus, it actively participated in the United Nations action in Korea to stop aggression, and supported the General Assembly Resolution "Uniting for Peace," which sought to make it possible for the Assembly to act when the 'veto' blocked action in the Security Council. Nevertheless, the defense and security arrangements in which Turkey participated, such as the North Atlantic Treaty Organization, the Turkish-Greek-Yugoslav and the Turkish-Iraqi Pacts, which are outside the organizational framework of the United Nations, but inside its sphere of interest, give rise to certain questions. In the short view, other approaches than those provided by the United Nations machinery may seem more expedient and convenient, but in the long perspective they may yet be inadvisable. To fail to use the United Nations machinery on those matters for which the Organization is given a special responsibility under the Charter, may tend to weaken the position of the Organization, even when the ultimate purpose which it is intended to serve is a United Nations purpose.

Turkey, like other under-developed countries, was much concerned with the economic activities of the United Nations and especially with the economic development of under-developed areas. Unlike the other smaller and weaker nations, however, it has shown an extreme indifference toward the problems of Trusteeship and Non-Self-Governing Territories and has not participated in the United Nations activities in this field.

The composition of the majority and the minority in the United Nations frequently varies from one issue to another. Some issues, however, have given rise to 'bloc' voting. Although Turkey is geographically and culturally a Middle Eastern country, it has long been in close association with Europe. Its current cooperation in the defense of the 'West' is reflected in the strong support it has given to the 'Western' nations in general, and the United States in particular, in all 'East-West' issues. On the issues involving conflicting views of 'colonial' and the more advanced 'Western' group of states, on the one hand, and the under-developed and 'anti-colonial' Asian-Arab-African group of states, on the other, Turkey has more frequently aligned itself with the former than with the latter.

Turkey and other smaller states are usually able to win recognition of their interest and aspirations in the United Nations -- a result which they would be far less likely to achieve without the United Nations. This is, in itself, a compelling reason for Turkey to do everything possible to strengthen the United Nations. Likewise, policies that are wise and that advance the cause of peace can be given a wider measure of support if they are pursued in the United Nations than they could by traditional methods of diplomacy.

363 pages. \$4.54. Mic 56-2008

PSYCHOLOGY

PSYCHOLOGY, GENERAL

FORMING IMPRESSIONS OF PERSONS FROM READING MATERIAL

(Publication No. 16,891)

Morton Bortner, Ph.D.
Columbia University, 1956

Previous research had demonstrated that a subject's impression of a person based on a verbal report listing character traits was essentially determined by the structure of the report. Small changes in the wording of the report often had the effect of completely altering the subject's impression of the person described. The present investigation sought to determine if small changes in a story passage would similarly affect the reader's impressions. It was hypothesized that the extent to which a reader attributes favorable or unfavorable qualities to a person described in a reading passage is a function of the adjectives used in the passage to describe that person.

It had also been shown that the reader's previously held attitude toward a given topic was related to his interpretation of reading material dealing with that topic. The present

investigation sought to determine how a reader's impressions were related to different extremes of positive or negative attitude. It was hypothesized that the extent to which a reader attributes favorable or unfavorable qualities to a member of a class of persons described in a reading passage is a function of his previously held attitude toward that class of persons.

The attitudes of eleventh grade students toward the topics chosen--Mothers, and Congressmen--were measured on Likert type scales. Each subject read one passage from each of two series of passages. The Congressmen series consisted of a Neutral Passage, three Unfavorable Passages which included the words dishonest, undemocratic, and boastful in the description of the congressman, and three Favorable Passages which included the words modest, reasonable, and democratic. The Mother series consisted of a Neutral Passage, three Unfavorable Passages which included the words cruel, unfriendly, and impatient, and three Favorable Passages which included the words polite, patient, and understanding.

The subject indicated his impressions of the person described by checking appropriate traits on check-lists. The responses were submitted to an analysis of variance with the following four factors controlled: (1) story

passage read, (2) subject's attitude toward topic, (3) subject's reading skills, (4) subject's sex.

The principal results and conclusions may be summarized as follows:

1. In the Mother series the Unfavorable Passages were perceived differently from the Neutral Passage.
2. In the Congressmen series the Unfavorable Passage containing the adjective judged to be most negative in affective value was perceived differently from the other Unfavorable Passages.
3. In both series it was not shown that the Favorable Passages were perceived differently from the Neutral Passage.
4. In the Congressmen series subjects with strongly negative attitude responded with significantly more negative impressions than subjects with mildly negative attitude.
5. In both series it was not shown that subjects with strongly positive attitude responded with more positive impressions than subjects with mildly positive attitude.

It was concluded that the extent to which a reader attributes favorable or unfavorable qualities to a person described in a reading passage is often a function of the adjectives used in the passage to describe that person. Negative adjectives add an unfavorable component to the reader's impressions. The results did not support the conclusion that positive adjectives add a favorable component to the reader's impressions.

It was also concluded that the extent to which a reader attributes favorable or unfavorable qualities to a member of a class of persons described in a reading passage is often a function of his previously held attitude toward that class of persons. A strongly negative attitude is associated with more unfavorable impressions than a mildly negative attitude. The results did not support the conclusion that a strongly positive attitude is associated with more favorable impressions than a mildly positive attitude.

136 pages. \$1.80. Mic 56-2009

EFFECT OF MACHINES, TASKS, AND TIREDNESS FEELINGS ON VARIOUS MEASURES OF OUTPUT CURVES OF TYPISTS

(Publication No. 16,706)

William Howard Enneis, Jr., Ph.D.
The Pennsylvania State University, 1956

An experimental study was conducted to determine the effect of various factors on different measures of output of employees engaged in continuous production which was not limited or paced by production methods. The independent variables were: 1) type of machine (manual and electric typewriters), 2) tasks (transcribing, standard paragraph copy, envelope addressing, and fill-in letters), and 3) subjective "feelings of tiredness" (employees' voluntary reports of times that they felt tired during the work day). The dependent measures of output were: 1) average daily and hourly output, 2) change in output rate during the last hour of each half of the work day, 3) absolute and relative variability of the hourly output curve, and 4) the shape of the hourly output curve.

It was hypothesized that those machines (manual

typewriters) and tasks (envelope addressing and fill-in letters) which presumably require more physical exertion during the work period would effect: 1) a greater relative decrement in output during the last hour of each half of the work day, 2) a more variable hourly output curve, and 3) greater dissimilarity in shapes of average individual work curves among the workers. It was also hypothesized that the number of subjective "tiredness feelings" would be inversely related to the amount of output.

A time series analysis of hourly output was expected to furnish information concerning possible cyclical changes in production due to hours of the day, days, weeks, and an experimentally imposed cycle of tasks.

The experimental design involved the collection of data over an eight-week period from fourteen women typists who were experienced on both types of machines and with the tasks required of them during the study. Twelve typists were assigned to Latin squares designed to measure the effects of machine and task differences on average daily output, output change, and hourly variability. These measures of output were subjected to separate analyses of variance. The output data for determining the shapes of work curves and relating production to tiredness feelings were also taken from this experimental design. However, coefficients of concordance were used to measure the agreement among typists' ranked average hourly output curves. Rank order correlation coefficients were computed between average hourly output and hourly indices of tiredness feelings. For the time series analysis, the autocorrelation coefficients of two typists were plotted separately against the respective lags to obtain a correlogram for each of the typists.

The following conclusions were reached: 1) There was no difference between manual and electric typewriters in terms of average daily output; 2) Typists on manual typewriters showed a significantly greater increase in output during the last hour of the afternoon than did typists on electric machines; 3) In terms of both absolute and relative variability, the combined data of transcribing and paragraph copy showed more variable hourly output curves than the combined data for envelope addressing and fill-in letters; 4) When doing envelope addressing and fill-in letters, typists recorded more tiredness feelings than when doing transcribing and paragraph copy; 5) An experimentally imposed cycle of tasks resulted in significant periodic changes in the correlograms of two typists, each operating a different type of machine (manual and electric); daily fluctuations, although less prominent, were also present; 6) The assumption that presumed greater physical exertion results in a greater relative decrement in the work curve, a more variable hourly output curve, and greater dissimilarity of the shapes of work curves among employees was not borne out by the data; 7) No relationship was found between tiredness feelings and output.

VITA

William Howard Enneis, Jr. Born December 18, 1928; Knoxville, Tennessee. Graduated from Knoxville High School, 1946. B. A., University of Tennessee, 1950, zoology. M. A., University of Tennessee, 1952, psychology. Ph. D., The Pennsylvania State University, 1956, psychology. Graduate assistant in psychology: University of Tennessee, 1952-1953; Pennsylvania State University, 1953-1955. 147 pages. \$1.95. Mic 56-2010

THE PREDICTION OF ASSAULTIVENESS IN HOSPITALIZED MENTAL PATIENTS

(Publication No. 16,708)

Millard G. Fisher, Ph.D.

The Pennsylvania State University, 1956

The purposes of the study were to determine whether it is feasible to develop an easily administered test which would discriminate between assaultive and non-assaultive patients and also whether subtle items in such a test would be better discriminators than obvious items.

The subjects were 160 hospitalized male assaultive and non-assaultive patients. An assaultive was defined as a patient who had struck or kicked someone at least twice within the last six months with little or no provocation, with obvious intent to harm, and in spite of reserpine, chlorpromazine or other therapy. A non-assaultive was defined as a patient who had never been known to have been assaultive before or since hospitalization.

A total of 667 true-false items were invented or borrowed from various sources. They were administered to preliminary groups of 10 assaultives and 10 non-assaultives. The responses of the two groups were tabulated, percentages were computed and weights assigned from 0 to 4 inclusive, using Strong's chart for alternative responses based on Kelly's formula. The 221 items which discriminated with weights of 3 and 4 and 27 others which were answered the same way by 80% or more in the two groups (conformity items) were organized into a second form of the test. This scale was administered to two additional groups, the selection groups, which were composed of 20 assaultives and 20 non-assaultives. Thirteen items received weights of either 3 or 4. These were combined with 15 conformity items and 52 buffer items in the third form of the test. This final test, therefore, had two scales: the A (Assaultiveness) Scale, which was a measure of assaultiveness and was composed of the discriminating items, and the C (Conformity) Scale, which was a measure of how well a subject was conforming with the standardizing groups and was composed of the high percentage of agreement items.

The final test was administered to two sets of cross-validation groups, one from the same hospitals the preliminary and selection groups were from and one from various V.A. and Pennsylvania State hospitals.

The mean C scale score for the first cross-validation groups was 18.75 and for the second, 19.74, out of a possible 23, indicating that these groups conformed quite well with the standardization groups on these items. The first cross-validation groups yielded a point biserial correlation of .54 as a validity coefficient, the second cross-validation groups, .33. The differences between the means of the assaultives and the non-assaultives were significant beyond the .01 level for both groups. The split-half, Spearman-Brown reliabilities on the C Scale for the first and second cross-validation groups were .94 and .63 respectively. The reliabilities for the A Scale were .84 and .57. In order to increase its reliability enough for widespread use such as in the second cross-validation group, each scale would have to be increased to four times its present length, according to the Spearman-Brown formula. The validity and reliability of the test is such that it would be serviceable in experimental work for groups of subjects, but is not suitable for individual prediction.

To fulfill the second purpose of the study, each of the 667 items was rated as either obvious or subtle by five

qualified judges. It was anticipated that a significant difference would have arisen between the number of each which discriminated, but this was not born out. Of the 13 items which held up, seven were rated as subtle and six as obvious. When the items which differentiated between the assaultives and non-assaultives with weights of 1, 2, 3, or 4 in the same direction in both the preliminary and selection groups were considered, the picture was largely the same. The difference in percentages between these subtle and obvious items was in the predicted direction but was not significant. Therefore, the supposition that the subtle items were better discriminators of assaultiveness was not supported.

VITA

Millard G. Fisher was born in Berwick, Pennsylvania in 1926. He attended school there until he was graduated from the Berwick High School in 1944. He served in the Army Air Corps during the war. He received his A. B. from Susquehanna University with a major in Psychology in 1950 and his M. S. in Clinical Psychology from The Pennsylvania State University in 1952.

He has served internships in psychology at the Kankakee State Hospital, Kankakee, Illinois and the V. A. Hospital, Lebanon, Pennsylvania.

82 pages. \$1.50. Mic 56-2011

THE RELATIONSHIP OF CONFORMITY AND CONSISTENCY OF VALUE ATTITUDES TO PERSONAL AND SOCIAL ADJUSTMENT

(Publication No. 16,784)

Wayne Butler Holder, Ph.D.

University of Missouri, 1956

Supervisor: David Bakan

A values inventory entitled the Inventory of Value Integration was specially written for the purposes of this study. The first portion of the dissertation is a manual of directions for use with the inventory. The second portion of the investigation contains an experimental study in which the inventory was used to establish conformity and consistency of value-attitudes. These scores were the basis of consideration of certain aspects of personal and social adjustment as they related to such measured value dimensions.

There were 136 subjects in the main study who were given the MMPI and the Inventory of Value Integration. The inventory contained 240 value-attitude statements, selected in terms of the two scoring criteria: conformity items were those on which 75% or more of the students in the validation group agreed in their answers; the consistency criterion was based on paired opposite items which 75% or more of the validation group answered consistently.

The reliability of conformity in value-attitudes on test-retest was .75, split-half reliability was .90 (with S-B correction); reliability of consistency on test retest was .69, split-half reliability was .87 (with S-B correction).

On the basis of MMPI profiles two qualified judges classified the Subjects: 87 normals, 38 non-normals and 11 unclassifiables. The normal group had significantly higher conformity scores than non-normals. The normal group also had significantly higher consistency scores than the non-normals.

The Welch Anxiety Index was computed for each subject on the basis of the MMPI subscores. The subjects were divided into three approximately equal groups: low con-

formity, middle conformity and high conformity. The difference in anxiety among these groups produced an F of 8.89, difference significant beyond the 1% level. The difference in anxiety was in the predicted direction with highest conformity accompanied by lowest anxiety, the middle conformity group ranking next and the lowest conformity group had the highest anxiety. The differences between the low conformity and middle conformity groups were significant as to anxiety. There was not a significant difference in anxiety between the middle and high conformity groups--although the latter group had lower anxiety. An eta correlation with anxiety on conformity was .34, which was significant. Anxiety bore a low negative relationship with consistency.

A high school group had significantly lower conformity and consistency scores than the undergraduate college group. But despite a considerable age difference a college graduate group did not have appreciably higher conformity and consistency scores than an undergraduate college group. It was indicated that these two scores tended to reach a fairly stable level at about age 20.

It was found that conformity did not correlate with intelligence; whereas consistency correlated significantly with intelligence.

The conformity and consistency scores correlated with each other with an r of .64. Despite this high correlation these independently derived scores functioned differentially in individual cases and in their relation to other measures on the same individuals.

Some supplementary findings indicated that women had higher conformity scores than men, although there was no difference in consistency. Subjects of Jewish preference and those with no religious preference had lower conformity and consistency scores than those of the Christian preference groups. 64 pages. \$1.50. Mic 56-2012

AN INVESTIGATION OF INSTRUCTIONAL MATERIAL NEEDS FOR MACHINE SHOP TRAINING

(Publication No. 15,406)

Harold William Porter, Ph.D.
Purdue University, 1948

Major Professor: C. H. Lawshe

A research problem making use of questionnaires and check lists for the purpose of developing a pattern for a suitable textbook which would insure psychological adequacy in terms of such factors as reading level, technical vocabulary, operations to be learned, order and arrangement, and proper use of illustrations.

Five surveys were conducted using as respondents a random sample of machine shop instructors and industrial workers in machine shops throughout United States, Canada, Puerto Rico, Hawaii and Germany. The instructors represent the various types of schools and classes of machine shop.

The first survey used a check list of all textbooks which might be on hand in school and with it the books on hand, books liked best and liked least were determined. In the second survey, respondents rated two books, one being a top ranking book from survey one, the other being a textbook to be revised by the author. The desirable and undesirable features of a textbook were thus determined. The third study was that present shop practices and trends.

The fourth survey used a list of trade terms which respondents checked as to their essentiality. In the fifth survey, use was made of a check list of basic operations in machine shop and resulted in the development of a list of basic unit operations. Using the results of these several surveys, an integrated pattern was developed for a machine shop textbook. 171 pages. \$2.14. Mic 56-2013

THE REVISION AND FACTOR ANALYSIS OF A PICTOGRAPHIC SELF RATING SCALE

(Publication No. 16,488)

Walter Vincent Romanowski, Ph.D.
Purdue University, 1956

Major Professor: Dr. Einar R. Ryden

The purpose of this investigation was to further the development of the Pictographic Self Rating Scale which may be used as an aid to learning by the classroom teacher.

The specific purpose of this study was two-fold: First, to revise the original Pictographic Self Rating Scale from an asexual stick figure form to an all male life-like figure form. Second, to factor analyze the fifteen items of the scale and determine what factor or factors were influencing the scores on the scale, and determine the significance of the total or part scores.

Utilizing the criticisms of professional consultants and the responses of students from four schools in Indiana, the necessary changes in pictures and wordings were made.

To obtain a measure of the reliability of the revised scale it was administered to 194 students. The test-retest method of estimating reliability was employed using a four week interval between testings. A correlation coefficient of .87 was obtained between the scores obtained by the two administrations.

The revised PSRS was administered to 1,819 students in fourteen high schools in Indiana for the purpose of factor analyzing the fifteen items of the scale. Three factors were extracted using Thurstone's multiple group method of factor analysis. The factors were called: Factor I, Feelings About Comprehension; Factor II, Interest; and Factor III, Participation.

That the inter-cluster correlations of the Rpq matrix were high is objective evidence that the three factors were not operationally independent. For this reason it was felt to be justifiable to use a total score on this instrument as a meaningful overall measure of student attitude, although it had been shown that this overall attitude contained dimensions of feelings about comprehension, interest, and participation.

The most important items measuring Feelings About Comprehension were: fourteen, one, and two, Difficulty in Learning, Reading Your Textbook, and Getting Started on Class Work, respectively. Item one was a relatively pure Factor I item.

The most important items measuring Interest were: nine, fifteen, three, four and ten, How Interesting is This Subject?, Value of Subject to You, Paying Attention, Thinking About Ideas Presented in Class, and Feelings About Grades, respectively.

Items eleven, five, and eight, Working Together on Projects, Reciting in Class, and Contributing to Class Learning, respectively, were the most important items measuring Participation.

Pilot studied of the relationships between students' self ratings and teachers' ratings of students on the PSRS were conducted using 302 students from Brook, Frankfort, and Kentland high schools (the 194 used in the retest project and 108 more) for the purpose of studying the relationships between the students' and teachers' ratings based on differences in: sex; class subjects; IQ levels (Kuhlmann-Anderson Intelligence Test given by teachers in eighth grade); school grade levels; teachers' judgement of needing or not needing assistance; above average, average, and below average in class performance as grouped by the teachers; and the length of time the teachers had known the students. The mean scores and correlations between students' and teachers' ratings were computed and the appropriate t-tests, chi square tests, and F-tests were performed to test the significance of the means and correlation coefficients for these various groupings.

The students' self ratings and the teachers' ratings of the students were correlated for 302 students and a correlation coefficient of .60 was found.

It was found that girls rated themselves higher than boys. Teachers also rated girls higher than boys. Groupings by class subjects and grade levels had no significant effect on how students rated themselves.

In agreement with comparable studies in the literature it was found that students of low intelligence rated themselves higher than the teachers rated them and students of lower intelligence rated themselves lower than the teachers rated them. In analyzing the mean scores of the students' self-evaluations it was found that those of low intelligence rated themselves relatively low while those of high intelligence rated themselves relatively high. The evaluations of the teachers were more closely related to the self-evaluations of the students for those of higher intelligence than those of lower intelligence, as was indicated by r's of .780 and .038 respectively.

It was also found that teachers evaluations were more closely related to the self-evaluations of students in the higher grades than in the lower grades, since the correlations between the students' and teachers' ratings were .840 and .237, respectively

Students judged by the teachers to be above average in classroom performance rated themselves significantly higher than those judged to be below average, and those students judged below average rated themselves significantly lower than those above average, according to their mean scores. In comparing the students' and teachers' ratings it was found that students judged as above average rated themselves lower than the teachers rated them, while those judged below average rated themselves higher than the teachers rated them.

The length of time teachers had known students had no significant effect on the closeness of agreement between students' self-evaluations and teachers' ratings of the students.

As has been said, the overall correlation between the students' self-evaluations and the teachers' ratings of the students was .60, using 302 eight through twelfth grade students. From this correlation coefficient it can be concluded that, although one cannot say exactly to what extent the teachers are in agreement with self-evaluations of students, one can say that they are not sufficiently in agreement with them to warrant reliance on classroom observation alone for understanding an individual student's

feelings about himself in relation to the classroom activities used in the PSRS.

138 pages. \$1.73. Mic 56-2014

A DESCRIPTION OF SOME EXECUTIVE ABILITIES BY MEANS OF THE CRITICAL-INCIDENT TECHNIQUE

(Publication No. 16,829)

Robert Edwin Williams, Ph.D.
Columbia University, 1956

Using a sample of 742 executives distributed proportionally by industry, by size of company, and by geographic location, "critical incidents" describing especially effective or ineffective performance of executives in critical situations were accumulated by interviews. The descriptions of more than 3500 such incidents were content-analyzed and classified into major categories of effective and ineffective executive performance.

From this classification a statement of 82 critical requirements for an industrial executive was derived, and an appraisal form for recording observations of executive performance was evolved. Tryouts of the method in four companies resulted in some simplification of the appraisal form. The method is considered to be useful only if appraisal results are to be used in executive development and not for absolute comparisons of performance.

81 pages. \$1.50. Mic 56-2015

SELF-PARENT SIMILARITY OF HIGH SCHOOL GIRLS IN RELATION TO TEACHERS' JUDGMENTS

(Publication No. 16,830)

Frank Arnold Wolff, Ph.D.
Columbia University, 1956

On the basis of studies in the nonintellectual determinants of intellectual efficiency and achievement, a relationship was hypothesized between teachers' judgments of the achievement and personality of female high school students and student-parent similarity.

Similarity was held to be an end-product of identification conceived as modeling intention. A device for measuring similarity was based on experiential data provided by the students in the form of trait ratings of self and parents. Present and ideal self were distinguished, the congruence of each self with each parent yielding four measures of similarity. The similarity of present self with the mother was given the primary assignment in testing the hypotheses.

In a preliminary study the checklist was administered to female high school seniors for the purpose of obtaining data on the reliability of all measures. The coefficients were judged adequate to allow the use of only one half of the checklist in testing the main hypotheses. It was administered to seniors graduating from the same high school in the following year. The achievement criterion was the

mean school mark, weighted by class hours, cumulative over the sophomore and junior years. The personality criterion was the preponderance of the number of favorable over unfavorable personality ratings on record cards.

A correlational analysis indicated that relationships were not consistent throughout the range of scores. Hence similarity scores were divided first into two, then into three subgroups, and a chi-square analysis was carried out to determine differences in the proportion of overachievers and of favorably rated personalities among similarity subgroups.

In order to appraise the intrinsic validity of the measures three subsidiary hypotheses were tested; two were based on the postulate that the self, present and ideal, of adolescent girls is more similar to the mother than to the father, and the third on the assumption that like ability of the parent and similarity are related.

Further, an analysis of certain factors other than similarity as possible determinants of discrepancy scores was undertaken. It produced evidence that dispersion of ratings and differences of rating level are related to similarity scores.

For the following results P was smaller than .05:

Subjects least similar to their mothers were less likely to overachieve than moderately similar subjects. (confirmed in Samples I and II)

Subjects least similar to their mothers were less likely to receive favorable personality ratings than moderately similar subjects. (holds for the hypothesis-originating Sample I, confirmed in Sample II)

The present self was more similar to the mother than to the father. (confirmed in Samples I and II)

The ideal self was more similar to the mother than to the father. (confirmed in Samples I and II)

Subjects most similar to their mothers rated their mothers more likeable than subjects least similar. (holds for the hypothesis-originating Sample I, confirmed in sample II)

Subjects most similar to their fathers rated their fathers more likeable than subjects least similar. ($P > .05$ in hypothesis-originating Sample I, but confirmed in Sample II)

For the following result in the combined samples P was smaller than .10 but greater than .05:

Subjects least similar to their mothers were less likely to overachieve than subjects most similar. ($P > .05$ in Sample I, $> .10$ in Sample II)

Contrary to expectation, no appreciable difference was found between the achievement and personality of moderately and highly similar girls. Certain explanations were proposed for this last finding and for the apparently accentuated positive results at the high IQ level.

The instrument is considered to have promising characteristics which may make it applicable to the study of insistent problems in the area of identification, conformity, and socialization. The present results are thought suggestive for the ongoing inquiries into parent-child relationships which facilitate the transmittal of knowledge and which shape personality as a source of impressions.

107 pages. \$1.50. Mic 56-2016

PSYCHOLOGY, CLINICAL

COUNSELOR PREDICTION OF ACADEMIC SUCCESS

(Publication No. 16,895)

Emerson Coyle, Ph.D.
Columbia University, 1956

Predictions are made judgmentally or actuarially.

Current review of the literature by Meehl indicates that in about half of the studies to date "the two methods are equal; in the other half, the clinician is definitely inferior. No definitely interpretable, fully acceptable study puts him clearly ahead."¹

The primary hypothesis of this study was: judgmental combination of qualitative and quantitative data was more accurate than mechanical combination of quantitative data.

The second, major hypothesis of this study was: use of counselor judgment itself as an additional variable in the thus augmented optimal mechanical combination of quantitative data increased the accuracy of the resultant prediction.

An entering class in the Division of Vocational Studies in the School of General Studies at Brooklyn College was used as the population from which the study sample was drawn.

In order to control for age, marital, and veteran status the following twin criteria for inclusion in the study population were established:

- (1) graduation from high school in January; and
- (2) registration as a matriculated Vocational Studies student the following month, February.

Of 121 students who met these twin criteria, 119 cooperated and were included in this study.

The following immediate twin criteria of college success were established:

- (1) C or higher average in initial semester; and
- (2) reregistration in the program the following semester.

Data obtained for each subject included: (1) high school credentials; (2) test performance on the Otis Self-Administering Tests of Mental Ability, Nelson-Senny Reading Test, Minnesota Clerical Test, Kuder Preference Record, and the California Test of Personality; (3) forty-five items of a biographical nature; (4) academic performance the initial semester in college; (5) registration status the following semester.

Each subject was interviewed individually for thirty minutes by one of five counseling psychologists who rated each subject in terms of the above twin criteria of college success on a five point rating scale: 5 excellent; 4 above average; 3 average; 2 below average; 1 very poor.

Counselors rated each subject on a combination interview schedule and evaluation form of 30 items on the basis both of the data enumerated above and the interview.

Statistical techniques employed included zero order and multiple correlations, testing of fiducial limits, Chi square test of significance, and tests of the significance of the difference between zero order r 's and multiple R 's.

Variables whose zero order correlations with the twin criteria of college success met or exceeded the .05 level of significance were: counselor rating .385, high school average .297, sex -.186, and size of program .217.

On the zero order r level the hypothesis that counselor prediction excels mechanical prediction must be rejected.

Multiple R's, including and excluding counselor ratings, were computed using the variables: high school average (ability in action), sex (role expectancy), and size of program (an index of self-committal).

There was no significant difference between zero order r of counselor ratings with the twin criteria of college success (.385) and the optimal R based on high school average, sex, and size of program with the twin criteria of college success (.415). On this basis the hypothesis that counselor prediction excels mechanical prediction was again rejected.

Multiple R's based on high school average, sex, and size of program excluding counselor ratings (.415) and including counselor ratings (.525) were compared to determine whether or not counselor rating added valid variance. A test of the difference of multiple R's indicated that the variance added by counselor ratings was significant at the .001 level.

Accordingly, the second hypothesis of this study, namely that counselor ratings add valid variance to the optimal mechanical combination of quantitative data, may be considered demonstrated 88 pages. \$1.50. Mic 56-2017

1. P. E. Meehl. Clinical vs. statistical prediction. Minneapolis, Minn.: Univer. Minn. Pr., 119 (1954).

PERSONALITY DIFFERENCES BETWEEN A HINDU AND AN AMERICAN GROUP

(Publication No. 16,803)

Desaraj Dhairyam, Ph.D.
Columbia University, 1956

The study compared some of the effects of the American and Indian cultures on the personality patterns of their respective members.

An examination of the two cultures led to the formulation of the hypotheses. The all-pervasive influence of the joint family system and the Hindu philosophy on Indians and of the conjugal family unit and the American Protestant ethics on Americans were specially considered.

It was hypothesized that the Indian group when compared to the American group would have (a) greater of traits affiliation, nurturance, succorance, deference, and resignation, (b) lesser of traits autonomy, achievement, dominance, and aggression, and (c) greater correlation between the traits of nurturance and succorance, and lesser correlation between the traits of dominance and deference, aggression and deference, and dominance and aggression.

Two groups representative of the two cultures were chosen. In these groups two cultural categories of persons who seemed to be distinguished in a similar manner by other members of their respective groups were selected.

The Indian subjects were Tamil Brahmins, urban resident for most of their lives. The American subjects were second generation or more, Protestants, resident for most of their lives in the northeastern or the northcentral sections of the country. Both groups of subjects were between 20 and 35 years of age, studying for advanced college degrees, and had a good command of the English language. They were the sons of persons who had been in college for

at least two years, and were, broadly speaking, of the same prestige status in their respective societies. The subjects were moving to an approximately equal status in their respective societies. There were fifty subjects in each category.

The nine traits that were the basis of the cross-cultural comparison were described in detail. A personality questionnaire based on the descriptions of the nine traits was specially constructed with sixteen items referring to each of the traits. A sentence completions test was also used, the scoring of which was based on the descriptions of the traits. A specially constructed vocabulary list tested the Indian subjects' comprehension of the questionnaire.

The tests, in the form of booklets with a personal information sheet, were administered to the American subjects individually by the experimenter. Qualified administrators gave similar booklets to the Indian subjects in Madras city. The subjects were retested after two weeks.

The Indian group when compared with the American group seemed to have more of the traits of affiliation, nurturance, succorance, deference, and resignation and less of the trait of aggression, but did not seem to have less of the traits of autonomy, achievement, and dominance. The Indian group showed a greater correlation than the American group between the traits of nurturance and succorance but there were no differences in the correlations between the traits of dominance and aggression, dominance and deference, and aggression and deference.

The analysis of the results gave clues to the nonverification of some of the hypotheses. This particular Indian group, because of its greater sophistication with the Western culture, might have emphasized the traits said to be predominant in highly industrial and competitive cultures such as that of America. On the other hand, the Americans might not have been any more autonomous, achievement oriented, dominant, or aggressive than the Indians in general.

The study was undertaken as an explorative investigation in the emerging trends of cultural psychology. A more thorough and comprehensive study would require research on a large scale involving the services of experts from the various allied social sciences.

138 pages. \$1.85. Mic 56-2018

THE EFFECT OF NEGATIVE INSTRUCTIONS ON RORSCHACH SYMBOLIZATION

(Publication No. 16,900)

Donald Lee Gold, Ph.D.
Columbia University, 1956

According to psychoanalytic theory, symbolization arises out of conflict between an impulse representation and its inhibition. In behavioral terms, this process might be viewed as a compromise solution to an adient-avoidant conflict. This experiment was designed to initiate such conflict by the presentation of negative instructions for overt sex response production on selected Rorschach cards and to compare the consequent degree of symbolization with that resulting from positive and neutral instructions. It was hypothesized that the negative instructions would

elicit a significantly higher degree of symbolization than either of the other instructional conditions.

Procedure

Three groups of 18 male college students were exposed to five Group-Rorschach slides. Following the reading of standard instructions, each group was given special instructions. Those for Group A were of a neutral order. Group B was instructed not to respond to the cards with overt sexual content. Group C was encouraged to give such content. Cards I, II, III, VI, and VII were then exposed, each for three minutes, while the subjects wrote down their responses.

Treatment of Data

A list of 1080 randomly assorted responses, composed of the first four responses of each subject to each card, was compiled for submission to the judges. Three judges scored the responses in accordance with a table of common psychoanalytic symbols arranged by Klopfer content category. In scoring the responses, the judges marked those containing symbolic elements, as set forth in the table of symbols, and specified the particular content categories to which they belonged. Responses scored as symbolic by two out of three judges constituted the data analyzed.

Results

Analysis of variance was used to test the significance of differences among groups in the total number of symbols produced and in the production of specific types of symbol. This test did not significantly differentiate the groups on the basis of specific or overall symbolic content production, thereby failing to confirm the hypotheses.

Additional Comparisons

To test the possibility that the criterion contained an overly inclusive range of content, more restricted comparisons were made among the groups. They were compared in regard to the use of areas responded to in normative studies with a high proportion of overt sex content. Differences among groups in the use of these "sex popular" areas were not significant. The negatively and neutrally instructed groups were found to produce symbolic responses within the "sex popular" areas significantly in excess of the positively instructed group. Since, however, 59 per cent of the positively instructed group's responses to these areas were overtly sexual in content, this difference appeared to have little bearing on the hypotheses. The groups were not found to be significantly different in the number of Popular responses produced.

Conclusions

The assertion that negative instructions elicit a higher degree of symbolization than positive or neutral instructions is not supported by the results of this experiment. These results suggest that a compromise theory lacks power as a useful formulation to account for symbolization. An examination of the scoring system used in this experiment reveals certain limitations, but not such as would contribute to the negative results obtained. Problems encountered in efforts to attain agreement among

judges in scoring symbolic responses point up the importance of the context in which symbolization is manifested and the apparently idiosyncratic character of many symbols. 49 pages. \$1.50. Mic 56-2019

SOME ASPECTS OF CONSCIENCE AND THEIR RELATIONSHIP TO INTELLIGENCE

(Publication No. 16,811)

Mark Grunes, Ph.D.
Columbia University, 1956

The purpose of the present study was to investigate the relationship between conscience and intelligence. Hypotheses were derived from theories stating that severe and unassimilated conscience is associated with lowered intelligence, while strongly developed and well assimilated conscience is associated with higher intelligence. Within the present study the term assimilated signified that conscience determined responses are compatible with other aspects of personality and have been modified in the light of the individual's personal experience.

Severe and unassimilated conscience was conceptualized in terms of two types, Nonintegrated Conscience and Moralistic-Repressive Conscience. Strongly developed and well assimilated conscience was designated Integrated Conscience. In order to measure the different aspects of conscience three personality scales were devised. Nonintegrated Conscience consisted of such factors as moral conflict, guilt, and anxiety. Moralistic-Repressive Conscience consisted of such factors as exaggerated conventionalism, over-idealization of moral authority, and excessive self-control. Integrated Conscience involved such traits as social consciousness, ethical orientation, and lack of cynicism.

The specific hypotheses asserted that Nonintegrated and Moralistic-Repressive Conscience are negatively related to intelligence, while Integrated Conscience is positively related to intelligence.

The three conscience scales and four tests of intellectual functioning were administered to a group of 355 undergraduate students in beginning psychology courses at the City College of New York. Of this number 212 were males and 143 were females. The total sample was heterogeneous with respect to age and intelligence. The religious background of the majority of subjects was Jewish, Catholics being the next most prominently represented group. A very small proportion of Protestant subjects comprised the remainder of the sample.

The range and distribution of scores obtained for the conscience scales made possible correlational tests of the hypotheses. The results obtained provided some support for the hypotheses, but it was found that the relationships between conscience and intelligence were influenced by such group factors as age, sex, and cultural-religious background.

In younger male and female samples, ranging in age largely from 18 to 21 years, there was no relationship between Nonintegrated Conscience and intelligence. For older male and female samples, ranging in age largely from 23 to 30 years, the predicted negative relationship occurred. For the older male sample, however, the

relationship was restricted to numerical reasoning, while for older females the relationship was much more extensive. Investigation of evening session subjects showed that Nonintegrated Conscience was negatively related to intelligence in the Catholic group and positively related to intelligence in the Jewish group. In the latter case, however, the relationship was significant only with respect to vocabulary.

The hypothesis of a negative relationship between Moralistic-Repressive Conscience and intelligence was more consistently supported than the hypothesized relationship between Nonintegrated Conscience and intelligence. For all groups the results indicated that individuals highly characterized by moralistic-repressive traits exhibit lower intelligence than individuals who show such traits to a lesser degree. With younger subjects, however, the relationship was less pronounced and largely restricted to the vocabulary measure of intelligence.

The hypothesis of a positive relationship between Integrated Conscience and intelligence was marginally confirmed for older women and Catholic males. The relationship was less pervasive, in terms of the number of tests of intelligence involved, than was the case for either of the other conscience scales.

The obtained results suggested that the emphasis placed upon assimilation of conscience as an important factor in intellectual development by the theories cited in the present study has some basis in fact. The theoretical nature of the relationship between conscience and intelligence, however, would seem to require further investigation and refinement in terms of the influence of such group factors as age, sex, and cultural-religious background.

188 pages. \$2.45. Mic 56-2020

RORSCHACH DIAGNOSIS, SOCIO-ECONOMIC CLASS, AND EXAMINER BIAS

(Publication No. 16,768)

William Haase, Ph.D.
New York University, 1956

Chairman: Professor Isidor Chein

PROBLEM

A review of the pertinent literature led to the hypothesis that an examiner can and often does have an effect upon the results obtained in clinical interviews. Specifically, it was suggested that the examiner's awareness of the social status of the client or patient would influence his evaluation of the latter, relatively favorably for the middle class patient and unfavorably for the lower class patient. It was assumed that such a bias would be less marked to the extent that the psychologist (1) was himself of relatively lower class origin, (2) was relatively more experienced, (3) was engaged in a practice that brought him in contact with lower class patients, and (4) tended to a Sullivanian rather than an orthodox Freudian outlook.

The study was designed to test for the existence of a class bias in the evaluation of Rorschach protocols and, if the major hypothesis was confirmed, to determine whether

the four characteristics of psychologists actually operated to reduce the bias.

PROCEDURE

Eight Rorschach protocols were constructed to provide four matched pairs, the members of each pair being equated for all the important determinants and ratios while the content was roughly similar. Empirical evidence is presented that the matching is effective. Social histories of eight alleged patients were also constructed to make up four pairs identical in every respect except for the income and occupation of the family breadwinner. Occupations and corresponding incomes were assigned so as to place four of the histories in the lower class and the matching histories in the middle class. Seventy-five clinical psychologists from the New York Metropolitan Area were employed as subjects. Each psychologist was asked to judge four Rorschachs to which a middle class history had been attached, and the twin of each of the four Rorschachs with a lower class history attached. The pairings of Rorschach records with social histories were systematically rotated from psychologist to psychologist so that every record was evaluated in conjunction with each of the social histories.

Evaluation by the psychologist of each Rorschach was accomplished by means of a number of eight point rating scales, each representative of a trait usually examined by the Rorschach technique, e.g., anxiety, depression, style of life, sexual maturity, etc. Included was a choice of four diagnoses (normal, neurotic, character disorder, psychotic) and a prognostic scale.

Three criterion scores -- pre-diagnostic impression (based on the trait scales), a conversion of the diagnosis into ratings of seriousness of psychopathology, and ratings of prognosis -- were subjected to statistical analysis by means of the T test, X^2 , and analysis of variance. The distributions of the evaluation patterns of the individual psychologists (favoring the middle class records, favoring neither, and favoring the lower class) were also analyzed in relation to a hypothetical chance trinomial model.

RESULTS

1. A bias detrimental to the lower class in relation to each of the three criteria -- pre-diagnostic impression, diagnostic score and prognostic scores -- was demonstrated.

2. There was a statistically significant tendency for psychologists to prefer a diagnosis of character disorder or psychotic for the lower class as opposed to one of normal or neurotic for the higher class.

3. There was no evidence of any relationship between the psychologists' own class origin, level of employment (trainee vs. staff), type of clientele (V.A. installations vs. state and county institutions), or theoretical convictions (Sullivanian vs. orthodox Freudian inclinations) and the appearance of bias.

4. Items defined as "less speculative" and more directly connected to the psychogram failed to give evidence of bias when subjected to statistical analysis.

The dissertation is 182 pages in length and includes all of the materials used, in an appendix, a table of contents, a list of 18 tables, and a 75 item bibliography.

191 pages. \$2.39. Mic 56-2021

RELATIONSHIPS BETWEEN ATTITUDES TOWARD THERAPIST AND ATTITUDES TOWARD PARENTS

(Publication No. 16,901)

Hanna Elizabeth Kapit, Ph.D.
Columbia University, 1956

The aspect of therapy which Freud called transference, and which may also be conceived as a generalization of feelings and attitudes from other significant figures to the therapist, is still little understood. In an attempt to clarify a small part of this problem, this study was concerned with the generalization of feelings and attitudes patients in therapy express towards their therapists and other significant figures.

The hypotheses under examination were:

(1) Among patients in psychotherapy, the generalization of feelings and attitudes from parents to the therapist is greater than the generalization from other significant figures.

(2) Patients in psychotherapy ascribe to their therapists feelings and attitudes described as valuable in their own personalities.

Testing these two hypotheses required a comparison of the patients' feelings and attitudes towards the therapist, parents, control figures (best friend, superior officer) and the idealized self.

The subjects for this study were 53 white male veterans, between 18 and 50, who received an average of two weekly sessions of psychotherapy on an out-patient basis at the Mental Hygiene clinic of the VA Regional Office in New York. To assess the patients' feelings and attitudes towards the test figures, the following three instruments were selected: (1) A questionnaire containing 20 items taken from the University of Southern California Attitude Survey (Shoben); (2) A trait list comprising 35 items of the Parent Cathexis Scale (Jourard); and (3) A color association test.

As shown by analysis of variance and t-tests, the results, excepting the nonsignificant outcomes with the color association test, were highly consistent and reliable. One hypothesis was confirmed, but the other was flatly contradicted. The assertion that patients tend to ascribe to their therapists those qualities they regard as most desirable in their own personalities was borne out by the data. On the other hand, the findings were opposite to the prediction that patients generalize to their therapists their feelings and attitudes toward their parents more than they do their feelings and attitudes toward control figures. Actually, the results justify three conclusions negating the original contention:

1. Of the figures tested, the degree of generalization between the patients' perceptions of the therapist and of their best friend exceeds any other.

2. The generalization occurring between the patients' perception of the authority figure and of the therapist are the second strongest.

3. The generalization occurring between the patients' perceptions of their parents and the therapist are the weakest.

Similarly, the results showed consistent trends in the evaluation of various figures by patients in psychotherapy. The most positive and likable characteristics are ascribed to the therapist with the best friend next in rank. The authority figure is perceived as essentially benevolent

and characterized by positive qualities. Parents, on the other hand, are regularly regarded as punitive, restrictive, harsh, and characterized by negative attributes. When the idealized self of the patients is compared with their conceptions of their therapists, the degree of correspondence is marked.

Thus, the first hypothesis was contradicted and the second was upheld. The notion of assigning parental characteristics to the therapist, an aspect of Freud's transference concept, was not confirmed. The degree of similarity of presented stimuli which determined the strength of generalization, as well as situational factors inherent in the particular setting in which this study was executed were different from a typical analytic situation, however, and may have influenced the results.

The close resemblance between the patients' idealized self and the perception of the therapist leads to interesting speculations as far as identification with the therapist and its practical use in therapy is concerned.

75 pages. \$1.50. Mic 56-2022

THE INFLUENCE OF STIMULUS MATERIAL AND GEOGRAPHICAL REGION ON RESPONSES TO A THEMATIC TEST

(Publication No. 16,902)

Armin Klein, Jr., Ph.D.
Columbia University, 1956

This study was concerned with the assumption that Negro subjects are limited in their fantasy participation in projective test situations which involve figures not structured as Negro.

A sample of 60 college students was employed in an experiment to test the hypotheses that (1) Negro subjects are more productive on the Thompson TAT than on the Murray TAT, (2) northern and southern Negro subjects differ in their productivity on the TAT, regardless of the version of that test employed, and (3) the difference in productivity between the two versions of the TAT is greater for southern Negro subjects than for northern Negro subjects.

Two auxiliary studies were carried out to elaborate, beyond productivity, upon the nature of the subjects' fantasy participation in Negro structured situations and situations not structured as Negro.

Group administration of the tests was used, with the stimulus pictures projected upon a screen. The efficiency of the manner of stimulus presentation was confirmed by an auxiliary study. Half of the subjects, containing an equal number of northern and southern subjects took the Thompson test first and the Murray test after an interval of one week. The other half of the subjects, with a comparable geographical distribution, took the tests in the reverse order, with the same time interval.

The stimulus pictures used were the Murray pictures 1, 2, 4, 5, 6BM, 7BM, 8BM, 12M, 17BM, and 18BM, and their Thompson counterparts. After the administration of the tests, comments were gathered from the subjects.

Productivity was measured in three ways. The number of words used by the subjects provided an objective measure of the quantity of production. The number of elements

in the protocols which could be used in the process of TAT interpretation provided an analytic measure of the quality of production. The elements counted were those which were reliably scored by two judges using the Vorhaus TAT Summary Record Blank. Finally, a subjective measure of the over-all productivity was provided by the combined ratings of two judges.

Results of the analyses of each of the three sets of productivity scores did not support the study's hypotheses. It was concluded that (1) there is no difference in the productivity of Negro subjects on the Thompson and Murray versions of the TAT, (2) there is no difference in the productivity of northern and southern Negro subjects on the TAT, and (3) the difference in productivity between the two versions of the TAT is no greater for one geographical group than for the other.

The results of the auxiliary study of the subjects' comments seemed to indicate that, in the subjects' conscious experience, the similarities of the two versions of the TAT were more important than the differences in the racial structuring.

The second auxiliary study compared the frequency of the judges' use of the various descriptive terms of the Vorhaus TAT Summary Record Blank in their scoring of the Thompson protocols with the frequency of their use of the terms in their scoring of the Murray protocols. No significant differences were found. This finding suggested that the two versions of the TAT were equivalent in eliciting behavior from the subjects which could be scored on the Vorhaus TAT Summary Record Blank.

The combined results of the experiment and of the descriptive studies were interpreted to suggest that Negro structured situations and situations not structured as Negro are equivalent in regard to the fantasy participation they elicit from Negro subjects.

71 pages. \$1.50. Mic 56-2023

DEVELOPMENTAL ASPECTS OF DISCRIMINATION IN RELATION TO ADJUSTMENT

(Publication No. 16,904)

Perry London, Ph.D.
Columbia University, 1956

Some psychological theorists have identified functional maladjustment with inability to make appropriate discriminations of generalized stimuli. Overgeneralizations are especially strong in affective situations, and appear most extreme in psychopathological individuals. In recent years, psychological research has studied the relationship of overgeneralization behavior in affective and nonaffective situations. Most studies, however, have neglected the developmental aspects of the problem.

The present study was concerned with the relationship of generalization and discrimination in normal and maladjusted children. It was hypothesized that the efficiency of discrimination performance of all children would vary progressively with age, that maladjusted children, relative to normals, would overgeneralize their responses to non-affective stimuli, especially to those with social properties, and that differences between normal and maladjusted

children in discrimination behavior would be greater for younger than for older children.

An instrument to test generalization behavior was constructed, consisting of six sets of graded stimuli. Each set contained fifteen cards with pictures which changed gradually from the beginning to the end of a series. Three sets were considered to have social properties in that they were pictures of human or human-like figures, and three were considered to be nonsocial in that they consisted of simple nonrepresentational figures.

Eighty maladjusted and eighty-seven normal children were tested at nine institutions. Maladjusted children were selected on the basis of professional reports indicating their need for psychological treatment, and normal children on the basis of the absence of indications of emotional disturbance. Only boys were employed in the sample; they ranged in age from four through twelve years. Both groups were comparable in age and intelligence. The tests were administered to the subjects individually. They were scored as subgroups, and the method both of administration and scoring was such as to maximize generalization behavior and to increase the reliability of the instruments. Several control studies indicated that adjustment status and age are primary determinants of performance on the instruments employed.

The results of this study offered support to three of the hypotheses. It found that efficiency of discrimination on the tests is a function of age, more so, however, for normal than for maladjusted children. It was also found that maladjusted children tend to generalize responses relatively more than normal children on all the tests, and to be especially prone to overgeneralization on tests with social properties. The fourth hypothesis, that differences between groups would be larger for younger than for older children, was not sustained. For the age groups studied, the data indicate a trend in the opposite direction.

75 pages. \$1.50. Mic 56-2024

PERCEPTIONS OF SIGNIFICANT FAMILY AND ENVIRONMENTAL RELATIONSHIPS IN AGGRESSIVE AND WITHDRAWN CHILDREN

(Publication No. 16,909)

David Sidney Shapiro, Ph.D.
Columbia University, 1956

This study extended investigations of the relationship between cognitive and other behavioral processes to the problem of personal adjustment. The specific question dealt with was whether characteristic patterns of overt adjustment are systematically associated with characteristic forms of perceptual behavior. Pursuit of this inquiry entailed the identification of groups of subjects differing markedly in overt adjustment patterns, the formulation of hypotheses accounting for such behavioral differences in terms of differing cognitions, and a final determination of relationships between the cognitive and adjustment variables.

Aggression and withdrawal in school-age children were selected as the adjustment variables. It was predicted that aggressive and withdrawn children would differ in the

degree to which they perceived the world to be threatening or in their perceptions of their resources for dealing with threat. Specifically, it was hypothesized that, in perceptual tasks related to significant family experiences, aggressive children would (1) estimate the size, strength, and ability of child figures to be greater than would withdrawn children and, similarly, estimate the size, strength and ability of child figures to be greater in relation to those of the parental figures than would withdrawn children; (2) expect punishment for various acts to be less severe than would withdrawn children; and (3) describe the immediate outcome of situations as more favorable than would withdrawn children.

The 101 subjects, boys aged six through ten selected from a public school population, were divided into an experimental group of 33 boys manifesting persistently aggressive behavior; an experimental group of 35 boys manifesting persistently withdrawn behavior; and a control group of 33 well-adjusted boys.

Each subject was given two perceptual tasks: (1) to answer questions about seven pictures of a family group in presumably anxiety-arousing situations; and (2) to draw a picture of his parents and himself. These tasks were designed to assess the subject's perceptions of five variables pertinent to the hypotheses being tested: (1) size, measured by the height in centimeters of drawings of parent and child; (2) strength, measured by responses to questions concerning tests of physical strength between a father and son; (3) ability, measured by descriptions of the behavior of parent and child figures in coping with critical situations; (4) expectations regarding punishments; and (5) expectations regarding the outcomes of situations.

The results obtained for the first hypothesis indicated that aggressive children do perceive child figures to be stronger in relation to parent figures than do withdrawn children but that the two groups have essentially similar perceptions regarding size and ability. The hypothesis that aggressive children expect punishments to be less severe than do withdrawn children was not supported. Substantial evidence was found, however, for the hypothesis that aggressive children would describe the outcome of situations as more favorable than would withdrawn children. The results obtained are consistent with the contention that cognitive processes mediate behavior and lead to the conclusion that differences in the overt adjustment patterns of aggressive and withdrawn children are related to differences in expectations about the outcomes of situations relevant to the needs and security of the individual. The evidence concerning the strength variable of the first hypothesis may be considered further support for the conclusion that aggressive children tend to be more optimistic than do withdrawn children.

The fact that significant results were obtained only when structured questions were used raises doubts about dependence on personality tests that require complex verbal responses to unstructured stimuli. Further, the essential similarity in absolute and relative size of the child and parent figures drawn by aggressive and withdrawn children casts doubt on the frequent assumption that the size of figures drawn reveals significant personality attributes.

58 pages. \$1.50. Mic 56-2025

PREDICTION FROM THE RORSCHACH OF BEHAVIOR IN A GROUP SITUATION

(Publication No. 16,912)

John Monroe Vayhinger, Ph.D.
Columbia University, 1956

The present study was designed to investigate the value of the Rorschach Psychodiagnostic Test for predicting the behavior of persons observed in interaction in small groups. Specifically, the experiment tested certain hypotheses taken from commonly accepted interpretations of Rorschach data. The interpretations were selected from commonly accepted books of theory, and research in projective testing. The selection was not exhaustive. Data selected on the basis of these interpretations were correlated with specific behavior observed in individuals under conditions of group interaction.

The investigation was done as part of a Group Research Design in the Guidance Department of Teachers College, Columbia University.

Forty students, members of a course in Group Development, were administered a Group Rorschach Test according to the instructions given by Harrower and Steiner. The protocols were scored in the Klopfer and Kelley system. The number of responses to the Rorschach protocols had a mean of 34.6 responses and a S.D. of 12.7. The individual responses were converted into percentages of the total responses.

Twenty-three interaction categories were prepared from three sources: the National Training Laboratory in Group Dynamics at Bethel, Maine, R. F. Bales "Interaction process analysis," and the four members of the Group Research Team.

The subject group was composed of 15 men and 25 women, all graduate students. Four ten member Basic Skill Training Groups were organized around specific interests. Electronic recordings were made of the 88 sessions. One group had average sessions of 51' 24". The groups were self directed, elected their own chairmen and recorders and operated as training interaction groups. The recorders reported to the entire class at general meetings. Other observations were made by the research team members, one of whom was with each group each time it met. Typewritten protocols were made of the groups' recordings and all responses were categorized.

The methods of percentages and rank-difference correlation were employed to determine if there were significant similarities (as hypothesized) between Rorschach categories and the subjects' behavior in small face-to-face groups. Thirty-six correlations were performed as each of the twelve hypotheses contained several sub-hypotheses concerning the major hypothesis' relation to several Group Interaction categories.

Only five of the hypotheses had significant correlations on the .05 level. One additional was significant in the opposite direction. Since chance would suggest that two significant correlations at the .05 level of confidence would be found with this many correlations, the study generally is negative and cannot be used to support Rorschach hypotheses.

Further validation study would be necessary before any of the significant correlations could be determined to be stable.

The significant correlations which supported these hypotheses are:

1. That Rorschach determinant Fc (shading as surface impression) correlates positively with Category I: "encourages, shows acceptance of others, friendliness, warmth, group solidarity, praising, accepting, commending another's status, rewarding, etc.," (+ .41).

2. That Rorschach determinant F (form) correlates negatively with a high total contribution to the group, (- .28).

3. That Rorschach determinant M (human movement) correlates positively with Category IV: "suggests action, presents a definite way or means of behavior," (+ .28).

4. That Rorschach content H (human) correlates negatively with Category X: "gives report, an account or presentation of data, evidence or observation on a given topic," (- .30).

5. That Rorschach content ratio H+A:Hd+Ad (human-animal whole responses: human-animal detail responses) correlates positively with Category XIX: "shows rejection of others," (+ .30).

The conclusion of the study is that under these conditions we cannot assume that success on one criterion has more than a low relationship to success on any other and for the most part has no predictive relationship between specific Rorschach hypotheses and an individual's behavior in groups.

113 pages. \$1.50. Mic 56-2026

THE PERFORMANCE OF SCHIZOPHRENIC INDIVIDUALS WITH HIGH AND LOW LEVELS OF ANXIETY FOLLOWING FRUSTRATION

(Publication No. 16,913)

Nathaniel Ned Wagner, Ph.D.
Columbia University, 1956

The concepts of frustration and frustration tolerance have been investigated with increasing frequency in recent years. Although there have been many studies, few have dealt with psychiatric patients. Those studies which have been conducted have yielded conflicting results. In an attempt to integrate these divergent results by introducing a new variable, the present investigation was concerned with the effect of anxiety level upon performance following frustration.

The subjects were 100 schizophrenic patients from the Veterans Administration Hospital, Montrose, New York. Two measures of anxiety were obtained. One was the Taylor Manifest Anxiety Scale and the other was a rating by the ward psychologist, who evaluated the subjects as high, moderately high, moderately low, or low in anxiety level.

Three anxiety groupings were used. First, the subjects were divided into two equal groups of fifty, using the median of their Taylor scores as the dividing point. Second, the anxiety ratings of the ward psychologists were used to divide the subjects into a high anxiety group and a low anxiety group. This grouping was composed of the subjects who were rated high and moderately high in one group, and the ones rated low and moderately low in the other. Third, the subjects were divided using just the extreme ratings of

high and low level anxiety. This latter grouping reduced the number of subjects from 100 to 32.

The tasks used were (a) the Ferguson Form Boards, (b) a lengthened Form I and Form II of the Digit Symbol subtest of the Wechsler-Bellevue Scale, and (c) the one-hand turn-and-place subtest of the Minnesota Rate of Manipulation Test.

Each task was administered in three phases. In the first phase, standard procedures were used, and the subject was permitted to experience success in his performance. In the second phase, speed was emphasized and the materials and time limits were adjusted so that success was impossible. The subject's failure was pointed out to him, and the experimenter expressed disappointment and surprise at his poor performance. The third phase, similar to the first, required the subject to work again at the tasks under standard conditions. It was thus possible to evaluate changes in performance as a function of frustration.

At the completion of the testing, a brief interview was conducted to elicit the subject's feelings concerning the testing and his impression of his performance.

The results indicated:

(1) On all three tasks, the highly anxious schizophrenic group manifested significantly lower scores following frustration than the less anxious group. This finding was true when the subjects were divided into groups at the median of their Taylor scores and when the extreme ratings of high and low level anxiety were used to divide groups. When the subjects were divided by the entire range of anxiety ratings, only the scores on the Ferguson test were significantly different.

(2) The highly anxious group rated their performance lower than the less anxious group. The differences were significant in the Taylor grouping and in the grouping of extreme high and low anxiety ratings.

(3) Highly anxious schizophrenics were more likely to blame themselves for their poor performance during the frustration phase, while the less anxious schizophrenics were more likely to deny that they did poorly or to externalize the cause of their poor performance. Only the Taylor grouping manifested significant differences.

Conclusions:

When anxiety is defined in terms of Taylor scales scores the following conclusions are warranted:

(1) There is a relationship between anxiety level and performance following frustration in schizophrenic individuals. Highly anxious schizophrenics manifest lower frustration tolerance than schizophrenics with low anxiety.

(2) After a frustration experience, highly anxious schizophrenics tend to rate their performance lower than less anxious schizophrenics.

(3) There is a relationship between anxiety level and acceptance of responsibility for failure during the frustration phase. Highly anxious schizophrenics tend to blame themselves for their poor performance, while less anxious schizophrenics tend to deny that they did poorly or to externalize the cause of their poor performance.

When anxiety is defined in terms of psychiatric ratings, the results are inconclusive.

74 pages. \$1.50. Mic 56-2027

MOTHER AND SON DESCRIPTIONS OF MOTHERS AND SONS IN A PICTURE STORY TEST

(Publication No. 16,914)

Miriam Drake Weston, Ph.D.
Columbia University, 1956

A study was made of the stories told by mother-son pairs in response to pictures which may be symbolic of their relationship. It was hypothesized that what they said would be related to the quality of their own relationship in terms of: (1) how much they agreed with each other, and (2) how positively they described the symbolic mother and child.

Subjects were thirty unrelated boys and their mothers obtained from a child guidance clinic.

The first part of the procedures involved an evaluation of the mother-son relationships from case material. On the basis of ratings given by three judges, subjects were divided into three groups having "adequate," "poor," and "very poor" relationships, respectively.

In the second part of the procedures, the subjects were asked individually to tell stories about thirteen pictures that had been developed for the research. All pictures included a child figure with one or more adult figures.

The thirteen stories were analyzed as a unit by means of a check list of twenty-four items. Each item could be scored as "positive," "negative," or "no information." The check list included items concerning the child figure in the stories and items concerning the mother figure.

A single score was devised to show the relationship between the positives and negatives in the subject's response. Mother-son similarity of descriptions was tested by a tau rank correlation of such scores.

The major findings were as follows:

1. In descriptions of the child in the pictures, mothers and sons with "adequate" relationships agreed with each other more than mothers and sons with "poor" and "very poor" relationships agreed with each other.

2. In descriptions of the mother in the pictures, mothers and sons with "adequate" relationships agreed with each other more than did mothers and sons with "very poor" relationships.

3. Mothers with "poor" relationships gave more positive descriptions of the mother figure than did their sons. Mothers with "very poor" relationships gave more negative descriptions of the mother figure than did their sons.

4. Boys and mothers with "adequate" relationships described the child figure more positively than did boys and mothers with "poor" and "very poor" relationships.

5. Boys with varying types of relationships did not differ significantly in their over-all descriptions of the mother figure. However, boys with "adequate" relationships gave more descriptions of a mother who was "warm" and who enjoyed her child.

6. Mothers with "poor" relationships described the mother figure as anxious about the child's safety more often than did mothers with "adequate" relationships.

7. Mothers with "adequate" relationships described the mother figure as expressing warmth toward her child and being loved herself more often than did mothers with "very poor" relationships.

It was noted also that the boy's description of the mother figure, his mother's description of the mother

figure, and the case judges' evaluation of the real mother were related differently for each of the three groups.

It was concluded that, in responding to pictures symbolic of family situations:

1. The descriptions given by mothers and sons are related to the quality of their own relationship.

The degree of mother-son similarity is related to the quality of the mother-son relationship.

On the basis of the findings, it was suggested that the picture-story technique for both parent and child could become a supplement to present clinic procedures.

124 pages. \$1.65. Mic 56-2028

PSYCHOLOGY, EXPERIMENTAL

AN INVESTIGATION OF THE ACTIVITY AND SENSORY RESPONSES OF HEALTHY NEWBORN INFANTS

(Publication No. 16,248)

Edith Dorothy Brownfield, Ph.D.
Cornell University, 1956

Chairman: Professor Mary E. N. Ford

Problem

The major purpose of this research was to investigate the relationship between "Spontaneous Activity," defined as activity and behavior which results from unknown internal or external stimuli, and the responses of healthy, full-term newborn infants to specific controlled sensory stimuli of the auditory, tactile, and kinesthetic type.

Subjects

The subjects were 100 infants selected from two nurseries of The New York Lying-In Hospital (a unit of the New York Hospital - Cornell Medical Center). They represented a 40 per cent random sample of the total population of these two nurseries born during January, February, and March 1953 who met the following criteria: healthy, normal, full-term, bottle fed infants who were spontaneously delivered (vertex presentation), after normal labor, by healthy, married mothers.

Procedures

An observational chart was designed for recording body movements, vocal behavior, and sleeping-waking condition in terms of eighteen ten-second time samples. Each infant was observed for at least two three-minute units a day during the first six days of life. Total observations per child varied from ten to eighteen units with an average of 14 per infant. The coefficient of internal consistency for the observational chart was +.98 (odd-even method corrected by Spearman-Brown formula).

Three sensory tests were designed. The stimulus for the Auditory test was a 500 gram weight dropped on a steel table, placed adjacent to the infant's crib. The same mechanical stimulus was used for the Vibratory test but in this case the infant was placed on the table so that

Vibratory as well as Auditory stimulation resulted. A special apparatus, designed to present a sudden six inch drop of the infant's crib, was used for the Position test. This battery of three tests was given to each infant and repeated once with 79 of the 100 infants.

The three sensory tests were scored on nine point scales which used the Infantile Startle Response as a unit of measurement. The immediate response to stimulation and the activity during the thirty seconds following the response were recorded.

Results and Conclusions

The Spontaneous Activity Scores (based on observational chart averages) ranged from 34 to 134 with a mean of 80 and a sigma of 19. The scores approximated a normal distribution. There were no sex differences in terms of activity. A comparison of the 33 infants having the highest Spontaneous Activity scores with the 33 having the lowest showed significant differences in amount of time awake; amount of vocal behavior; and activity level and amount of vocalization during the hour immediately preceding feeding.

Test-retest reliabilities of all three sensory tests were low (+.45 to +.64). Infant responses were more vigorous to the Position test and least vigorous to the Auditory test. Comparison of high-low activity groups (differentiated on Spontaneous Activity scores) showed no significant differences between the two groups in respect to Vibratory and Position test responses. There was a statistically significant difference between the two groups in regard to activity following the Auditory test. The amount of vocalization during the 30-second period following each of the three tests differentiated the high-low groups better than test scores.

The sensory tests were positively correlated with the Spontaneous Activity scores but the coefficients were too low to justify use of the sensory tests singly or as a battery for predictive purposes.

It is concluded that the major contributions of this study are the development of a time-sampling technique for the observation of young infants; and the establishment of tentative norms for the activity levels of healthy newborn infants.

283 pages. \$3.54. Mic 56-2029

THE EFFECTS OF TACHISTOSCOPIC TRAINING IN DIGIT PERCEPTION ON EYE MOVEMENTS IN READING

(Publication No. 16,806)

August Armandus Fink, Ph.D.
Columbia University, 1956

It has been shown that tachistoscopic training with digits increases reading speed. Reading speed can be increased by improving any or all of the three basic motor aspects of reading. This experiment was designed to establish which of these three motor aspects was affected most by tachistoscopic training.

Sixteen subjects, four each in four groups, were given two pre- and two post-training reading tests. Ophthalmograph records were taken during the reading of one of the pre- and one of the post-training reading tests. The three experimental groups were treated identically with the

exception of one variable. This variable was the delay in call-back of the shown digit during the training period. The fourth group acted as a control group.

The 16 subjects were all between the ages of 12 and 13 years. An attempt was made to select subjects who were not highly motivated to increase their reading speed.

Delay in call-back did affect performance in the training period. The shorter the delay the better the performance. These differences in performance were not reflected in reading rate improvement which appears to be quite independent of proficiency level reached in digit perception ($r = .06$). The correlation between reading rate gains and number of regressive eye movements eliminated through tachistoscopic training was .92.

It was concluded that tachistoscopic training does not affect major changes in average fixation duration or number of fixations. It was further concluded that the reading rate gains reported here were primarily due to the extinction of regressive eye movements.

22 pages. \$1.50. Mic 56-2030

THE ROLE OF LEARNING FACTORS IN THE DEVELOPMENT OF SOCIAL BEHAVIOR IN LABORATORY RODENTS

(Publication No. 16,783)

Elaine Edith Holder, Ph.D.
University of Missouri, 1956

Supervisor: Melvin H. Marx

Investigations of social behavior in laboratory rodents were reviewed under the general categories of early experiences, isolation, social facilitation, imitation, cooperation, gregariousness, dominance relationships, aggression and competition. A summary of learning principles indicated that it would be profitable to study the operation of individual learning variables in social interaction situations.

The second part of the report consisted of a report of several experiments which investigated the relationship between secondary reinforcement and conditioned frustration properties of social stimuli and social facilitation and inhibition. A total of 106 albino rats were used in five experiments. The results of the first four experiments were used principally to determine the procedure and control of variables for the fifth experiment.

In the fifth experiment all subjects were given forty training trials, half rewarded and half non-rewarded in a random order. In the control group, a stimulus rat was released with the subject on half of the rewarded trials and half of the non-rewarded trials. In the reward group the stimulus rat was released with the subject on all rewarded trials and the subject was released individually on all non-rewarded trials. In the frustration group, the stimulus rat was released with the subject on all non-rewarded trials and the subject was released individually on all rewarded trials.

The results indicated that during the training trials, the stimulus rat was a discriminative stimulus for reward for subjects in the reward group and for non-reward for subjects in the frustration group. In the reward group

subjects ran faster on paired trials than on individual trials. In the frustration group, subjects ran faster on individual trials than on paired trials. The differences were both significant at the .01 level. In the control group, there was no difference between paired and individual trials.

Following the training trials, all subjects were given test trials in a cooperative testing apparatus in which the subjects had to press a lever to release the stimulus rat from a detention box and both rats had to be at the food tray before food was released for either animal. Subjects in the reward group learned the habit more rapidly than the control group and subjects in the frustration group learned the habit less rapidly than the control group. The differences were both significant at the .05 level of confidence.

All subjects were given four individual trials in a double straight runway followed by 10 paired trials in the same runway. Subjects within each group were run in pairs and both subjects were rewarded on all trials. The subjects in the reward group ran more slowly on paired trials than control subjects and subjects in the frustration group ran more rapidly on paired trials than control subjects. These results were explained in terms of the subgoal properties of secondary reinforcement stimuli and the irrelevant drive properties of frustration stimuli.

Ten additional trials were given in a long straight alley in which the only reward was release of the subject into a box containing a stimulus rat. The results of these gregarious test trials were ambiguous. There was a tendency for the reward group to run more rapidly than control subjects and for the frustration group to run more slowly than control subjects, but the *t*'s were not significant.

In general the results of the experiments indicated that previous association of stimulus rats with reward or non-reward has different effects on the social learning of rats in different kinds of social situations. Previous association of stimulus rats with reward resulted in faster learning of a cooperative habit and slower learning of a paired running response than control subjects. Previous association of stimulus rats with non-reward resulted in slower learning of a cooperative habit and faster learning of a paired running response. There was a tendency for previous association of stimulus rats with reward to result in faster learning of a gregarious response and for previous association of stimulus rats with non-reward to result in slower learning of a gregarious response, but the results were not significant.

It was concluded that in spite of the difficulties involved in the use of organisms as stimuli, the difficulties of measurement, the problems of control, and construction problems in regard to apparatus, the social behavior of animals can be studied with traditional laboratory methodology. Many of the individual variables have already been demonstrated and can thus be controlled. There is a very rich field of experimental data in the study of social interaction variables that has relevance both to learning theory in general, and to theoretical approaches to social psychology.

102 pages. \$1.50. Mic 56-2031

THE DISTANCE MEASURE AS A STATISTIC FOR CLUSTERING JOBS

(Publication No. 16,907)

David Bram Orr, Ph.D.
Columbia University, 1956

The problem investigated was the adequacy of the *D* measure as a means of clustering jobs on the basis of aptitude data. Given a sample of jobs, how many clusters exist in the sample, which jobs go into which clusters, and what are the aptitude characteristics of the final cluster structure?

The hypotheses were general and of an exploratory character: (1) The *D* measure offers a consistent, workable technique for clustering jobs on the basis of aptitude data; (2) The job cluster's resulting from this clustering technique will be consistent, reasonable, and describable in terms of outstanding aptitudes or patterns of aptitudes.

Data were taken from a larger study by the United States Employment Service on the functional classification of jobs. The data were ratings of jobs on a five point scale for the following aptitudes derived from the United States Employment Service General Aptitude Test Battery: Verbal, Numerical, Spatial, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, Manual Dexterity, and Intelligence. These data were available for a sample of 4000 jobs drawn from the *Dictionary of Occupational Titles* so that they were representative of this population of jobs on such items as code area in the *DOT*, variety of functions, industry, and level of complexity. The two samples used in the study were of 140 jobs apiece, and were drawn completely independently with replacement from the master sample of 4000 jobs. A third (Validation) sample of 28 jobs was also drawn independently without replacement from the same source.

The procedure was to apply the Distance *D* measure to the problem of clustering jobs. The clustering was done independently for two samples for two separate criteria of final structure. The first criterion was the requirement that every job be closer on the average to the members of its own cluster than to the members of any other cluster; the revised criterion was maximal compactness as measured by the average distance of all jobs from their respective clusters taken over all clusters.

Six was considered to be the best number of clusters for these data. Each sample was clustered on the basis of six clusters and clusters from the two samples were matched by the *D* measure so that every cluster in each sample had one and only one matched partner in the other sample. Then each job in the Validation Sample was placed in one cluster for each sample by its distance from the cluster centroids. The statistic of consistency was the percent of the Validation Sample falling into matched clusters. Subsequently the clusters were described in terms of kinds of jobs and patterns of aptitudes found therein.

Hypothesis One was considered supported. The percents of perfect agreement were 71.9 and 75.0 respectively for the original and revised criteria of re-assignment. The percents of agreement including the next closest cluster in either direction were 71.9 and 90.6 for the original and revised criteria, respectively.

Hypothesis Two was considered supported by the reasonableness and consistency of the content of the clusters.

The content of the clusters was roughly the same for

both of the criteria. The chief differentiation seemed to be in terms of an intellectual-supervisory, mechanical-manual, and clerical division, with further differentiation on the basis of level. There were three clusters mainly composed of high, medium, and low level mechanical-manual jobs, respectively; two clusters were differentiated on the basis of high and average intellectual-supervisory

demands, respectively; and one cluster emphasized clerical and minor supervisory functions.

It was concluded that the revised criterion was the more satisfactory for general purposes and that the use of the D measure as a clustering procedure showed promise enough to warrant further investigation of its properties and uses in several fields.

184 pages. \$2.40. Mic 56-2032

RELIGION

**THE PORTUGUESE NEW TESTAMENT
IN THE LIGHT OF MODERN RESEARCH:
ITS TRANSLATIONS AND TEXT**

(Publication No. 16,866)

Benedito de Paula Bittencourt, Ph.D.
Boston University School of Theology, 1956

Major Professor: Dr. David K. Kim

The purpose of this dissertation is to show the need for an accurate and modern translation of the New Testament into Portuguese.

The history of translations shows that many efforts were made in the past four centuries to produce a better New Testament in Portuguese. King Dom Dinis (1279-1325), King Dom João I, Gonçalo de Santa Maria, Leonora (wife of King Dom João II), and Bernardo de Brivega attempted to translate. The first serious work was done by João Ferreira de Almeida. His first edition was published in 1681 and it is still used after many revisions. Antônio Pereira de Figueiredo, a Roman Catholic priest, published his first translation from the Vulgate in 1781. The first translation printed in Brazil was that of Fr. Joaquim de N. S. de Nazareth, in 1847. At the turn of the century the Franciscan Fathers published the Gospels and the Epistles. Huberto Rohden was the first Catholic scholar to translate the New Testament from Greek, about 1927. Matos Soares's translation from the Vulgate is the official edition of the Catholic Church in Brazil today. As for Protestant works, The Brazilian Version, which is not universally accepted, was published in 1917. In 1951 a newly revised edition of Almeida was published by the Sociedade Bíblica do Brasil. It has many improvements, mainly in the matter of modern Portuguese, but a modern and scholarly version is still an urgent necessity.

Only two or three critical editions of the Greek text have been used in Portuguese translations. Tischendorf and Westcott-Hort are out of date. Even their methods have proved inaccurate in some respects. Today many new discoveries (such as Sy.^{s.}, W, P⁴⁵) and new textual theories have affected the text. The studies in the "Western" and "Caesarean" texts, versions, and the quotations of the Church Fathers have revolutionized textual theories. Nestle's text is merely a result of mechanical selection. The present writer has reconstructed a sample of a new Greek text. A critical reconstructed text of the entire

New Testament is indispensable to producing a better Portuguese New Testament.

Nestle was chosen as the basis of the latest Portuguese revision. In eighteen cases, Nestle makes great omissions on the basis of new knowledge from manuscripts, versions, and patristic quotations. But the revisers inserted the passages as found in the Textus Receptus. They were forced to do so under pressure of tradition and dogma. Various passages have been analyzed in this dissertation to show the need of a better translation. The good translator should take into consideration several pertinent facts such as textual evidence, New Testament theology, etc. Rom. 5:1 is a good example. Even small particles should be carefully translated. For example, the Greek word opse (Mt. 28:1) should be regarded as a preposition (depois de), not as an adverb (no findar). Furthermore, grammatical tenses and moods should not be overlooked. For example, Almeida's revision reads: "Vêde com que grandes letras vos escrevi" (Gal. 6:11). It is a case of mistranslation of the epistolary aorist. The better translation would be "Vêde com que grandes letras vos escrevo". The New Testament designations city, town, village, sea, lake, mountain, time, measure, coins, etc., should be converted into modern terms. For example, the Sea of Galilee must be designated as a lake rather than a sea, and it should be rendered "lago da Galiléia" in Portuguese. Even the titles of some of the books of the New Testament need revision. For example, neither "Epístola de Paulo a Timóteo", nor "Epístola de Paulo aos Efésios" represents the literary or historical reality of the two epistles.

289 pages. \$3.75. Mic 56-2033

PAUL'S USE OF THE OLD TESTAMENT

(Publication No. 16,890)

Mary Lily Boney, Ph.D.
Columbia University, 1956

The problem faced in this study is that of the interpretation of the Old Testament as reflected in the letters of Paul. This has involved a consideration of the nature of the Bible used by the apostle, and an analysis of his Scripture interpretation as to both form and content.

Previous studies, beginning with that of Capellus in

1650, have established the fact that Paul was working with a Greek text. A study of his quotations indicates that in the main they are quite close to Septuagint wording, but the apostle deviates from the known recensions of this version enough to make one hesitate to say that he was using it. Proposals by Böhl, Vollmer, and Rendel Harris are considered and found to be inadequate as satisfactory solutions to the problem. The suggestion is offered that Paul was to a large extent depending on his memory, which though excellent was not infallible. More light on the problem is to be hoped for upon further investigation of the possibility of a "Proto-Septuagint" from the findings of the Qumran caves.

An analysis of Pauline exegesis in relation to other Old Testament interpretations has not been available in English. O. Michel published *Paulus und seine Bibel* in 1929, and Joseph Bonsirven made his comparison of Pauline and rabbinic exegesis in 1939. Both works were done before the Qumran manuscripts were available. This study deals with the characteristics of the apostle's exegesis, and concludes that the most basic and significant hermeneutical principle which he uses is that of typology.

In an effort to understand Paul's use of the Old Testament in a first-century setting, comparison has been made with the scriptural interpretation of other significant groups and individuals who lived at approximately the same time in Palestine and in the Diaspora. Quotations and allusions of the Tannaitic rabbis, of the sectarians in the Qumran community, and of certain contemporary Hellenistic writers are considered in their relation to the apostle's use of Scripture. Although in some details his exegesis indicates a possible affinity to that of the rabbinic scholars, closest similarity is found between the work of Paul and that of the Covenanters.

The apostle's interpretation goes beyond that of his contemporaries, however, as he transcends legalism and apocalypticism in an attitude reminiscent of the prophetic spirit out of which these trends grew. Paul through typology found in Scripture profound insights into the nature of the relationship between man and God when seen as the anticipation of God's climactic act of redemption. He found in the story of Adam the key to the meaning of sin; in the experience of Abraham, the necessity of faith for salvation; in the account of Moses, the basis for the covenant relation; in the entire record of the chosen people, the nature and purpose of election. The clue to his understanding of each element in the Old Testament story is to be found in his conviction that God finally revealed the "mystery" of all of Scripture in Jesus Christ.

While the details of the apostle's methods would not be held consistently valid in twentieth-century biblical study, the spirit of his hermeneutics and exegesis is timeless for a dynamic Christian interpretation of the Hebrew Scriptures. 210 pages. \$2.75. Mic 56-2034

CONCEPTS OF THE SOURCE OF PSYCHIC DISHARMONY AND OF THE FALL OF MAN

(Publication No. 16,867)

Newell Snow Booth, Jr., Ph.D.
Boston University School of Theology, 1956

Major Professor: Dr. John D. Copp

What, if any, is the relationship between interpretations of the source of psychic disharmony by certain depth psychologists and concepts of the Fall of man held by certain theologians? Those compared are the psychologists, Freud, Adler, Jung, Rank, Horney, and Kunkel, and the theologians, Brunner and Niebuhr.

Freud sees man driven by instincts which bring inner and outer conflict. The focal point of this conflict is in the child's relationship to his parents. A primal slaying of the father by his sons is also postulated. Adler sees the child developing early feelings of inferiority which lead to an overcompensating will to power out of which conflict arises. Jung believes that the prohibition of the incest wish leads man to develop a persona separated from the larger collective self, much of which becomes unconscious. Rank emphasizes the separation due to the birth trauma and the striving of the will. Horney sees a culturally conditioned basic anxiety giving rise to a false self. Kunkel holds that the original harmony of life is breached by a sense of separation from the parents.

The background of Brunner's and Niebuhr's thought is found in the Bible, Augustine, Luther, Calvin, and Kierkegaard. Brunner sees man created to live in a harmonious relationship to God, but choosing instead to rebel, and living in a state of inner and outer tension which he cannot overcome. Niebuhr emphasizes man's anxious position on the border line of nature and spirit and his refusal to accept his limitations. In trying to overcome them he destroys his harmonious relationship with God, others, and self. Both theologians see the Fall as a racial as well as an individual event, although it cannot be dated.

These authors are all aware of some relationship between the psychological and theological views of the source of man's disharmony. The psychologists refer to the Biblical story of the Fall, but not to current theological thought. The theologians are aware of depth psychology and accept many of its findings, while largely rejecting its presuppositions.

In general, all these writers agree that man is a unity of body and mind driven by energies basically neither good nor evil. Each individual carries a racial heritage and repeats in part its development. Man is anxious because of his uncertainty. The limitations he meets stimulate this anxiety and bring forth rebellious reactions against parents, society, and God. These reactions always are overdone. The age of two to four is the focal point of this rebellion, but it also occurs at other times and may have occurred in the race as a whole. The rupture of man's harmony is inevitable, at least in our culture, although some of these writers believe man is theoretically free to avoid it.

Accompanying this rebellion is a development of self-centeredness, obscuring portions of the self. A division arises between desire and obligation. Aggression toward self and others and sexual disturbances accompany man's

rebellion, and even his highest creativity reveals his disharmony.

Although they accept the validity of certain psychological concepts, the theologians are primarily concerned with man's rebellion against God, and would not be able to work within the framework of depth psychology. The psychologists generally deny the objective validity of theological concepts and deal with man's conflict solely within his human environment. They could, however, work within a framework which took account of theological concepts as valid. The theological frame of reference is thus more inclusive.

Further communication between psychologists and theologians, and studies of mutual problems would be helpful to both fields. 260 pages. \$3.35. Mic 56-2035

RICHARD BAXTER'S CONTRIBUTION TO THE COMPREHENSION CONTROVERSY: A STUDY IN PROJECTED CHURCH UNION

(Publication No. 16,868)

Earl Kent Brown, Ph.D.
Boston University School of Theology, 1956

Major Professor: Dr. Richard M. Cameron

The study is an investigation of the thought and activity of Richard Baxter in the area of church union and cooperation. Three things appeared: (1) a descriptive historical survey of Baxter's thought and activity in this area; (2) the changes in Anglican usage he deemed desirable to achieve comprehension—i.e., the inclusion of the Puritans in the Establishment; (3) the terms he deemed the minimum acceptable to achieve comprehension.

(1) Baxter began his work for concord long before the Restoration. While at Kidderminster he organized the Worcestershire Association, a local society for the cooperation of ministers of diverse political, ecclesiological, and doctrinal positions. He also undertook numerous conversations with Episcopal, Independent, and Anabaptist leaders.

The Restoration threw Baxter into the forefront of negotiations for comprehension. In his writings, presented to the King and to the Savoy Conference as expressions of the Puritans' demands, we find the terms he deemed desirable to this end. The negotiations broke down, and some 1800 ministers were driven from the Church by the Act of Uniformity of 1662.

During long years of persecution Baxter took part in several negotiations with leaders of the Episcopal party. Full agreement was reached twice, and an Act of Comprehension was drafted for presentation to Parliament. In the bill of 1675 we find the minimum acceptable terms to accomplish a comprehension. These irenic endeavors too were frustrated by certain of the higher clergy. In 1679, following the expiration of the Press Licensing Act, Baxter's pen was free once again. He published a flood of books in the next five years which involved him in a series of bitter controversies.

During the closing years of Baxter's life two proposals for greater cooperation appeared which were prepared by ministers under his influence, and which have decidedly

Baxterian overtones. One of them was a plan for a comprehension recommended by an Ecclesiastical Commission of the Church of England. The second was an agreement of the Congregational and Presbyterian Nonconformists in London to cooperate with each other. Both plans failed, and Baxter's dream of one, catholic, national church in England did not materialize.

(2) The changes in Anglican usage deemed desirable in order to obtain a comprehension were many and varied. On grounds of ancient church practice a system of synods, with Bishops presiding, was suggested to replace the prelatical episcopacy. On grounds of convenience extensive "Alterations and Additions" to the Prayer Book were suggested. Primarily on grounds of expedience—i.e., to satisfy the conscience of the Nonconformists—many "Exceptions" to the Prayer Book were urged.

(3) The minimum acceptable terms to a comprehension are found in the proposed Act of Comprehension of 1675. The bill provided for an abandonment of the oath of "assent and consent" to everything in the liturgy, made certain of the controverted ceremonies optional, and explicitly recognized the validity of non-Episcopal ordination. Until these concessions were made Baxter felt forced to remain a Nonconformist.

It will be noted that Baxter was willing to abandon many of his demands. His doctrine of the Church explains his position. For him any congregation was a true church which professed belief in the sufficiency of Scriptures and in the Gospel of Christ as revealed therein or, as summarily expressed, in the Decalogue, the Lord's Prayer, and the Apostles' Creed. He was therefore willing to give up all the peripheral modifications demanded in 1660-1661, if the Anglicans would give up their objectionable peripheral demands in return. These marginal matters are the "things unnecessary" in his famed motto, "Unity in things necessary, Liberty in things unnecessary, and Charity in both." The "things necessary" in this formula are the "Fundamentals of the Faith" noted above. Baxter urgently sought union on these essentials, for he felt they constitute true Christianity. 344 pages. \$4.40. Mic 56-2036

THREE VALUE THEORIES AND THEIR IMPLICATIONS REGARDING THE PLACE OF RELIGION IN TEACHER EDUCATION

(Publication No. 16,869)

Thomas William Hall, Ph.D.
Boston University School of Theology, 1956

Major Professor: Dr. S. Paul Schilling

The problem of the dissertation is to discover the place of religion in teacher education as implied in three value theories; and to develop an axiological system, showing its implications regarding the role of religion in the training of public school teachers.

Following a historical sketch of the controversies surrounding the problem of the place of religion in education, the axiologies of John Dewey, Edgar Sheffield Brightman, and Henry Nelson Wieman are described and evaluated. The implications of each theory regarding religion in teacher education are set forth. Finally, an attempt is

made to construct a synthetic axiological foundation for religious values. The specific implications for religion in teacher education are then developed.

The instrumentalism of John Dewey is found to support the approach to religion through moral and spiritual values described by John S. Brubacher and others in *The Public Schools and Spiritual Values*. However, Dewey's theories imply that if teaching facts about religion as they are intrinsic to other learning situations will be helpful to the student in solving his own problems, if such study will be meaningful to future tasks of the prospective teacher, and if it does not thwart the progressive enlargement of experiences, then such teaching about religion is desirable.

Brightman insists that religious values are of the highest intrinsic worth. Religious values are good in themselves and are also a way of perceiving all other values. He maintains that every student ought to study philosophy in order to build a sound outlook on life and root his religious faith in the ontologically real. If the student's religion does not stand rigorous investigation, it ought to be modified and enlarged by all other facts and values. Moreover, Brightman's emphasis on the coalescence of all values clearly implies that all important facts and the ability to think clearly (intellectual values) be linked with religious, moral, aesthetic, and social values within the various academic experiences of the student. However, his emphasis is on persons as rational beings, and his philosophy of education tends at times to over-emphasize the intellectual values.

Wieman's main contribution to value theory is his conception of the creative event as the absolutely good reality which deserves ultimate loyalty. This event is the supra-human reality which creates all good. Since the creative event works through human intercommunication where qualitative meanings (intrinsic values) are created, he proposes that creative intercommunication is the condition where good can continually be created. Wieman's theory implies, therefore, that the total religious context for teacher education should be a method of class procedure where free expression and deep intercommunication take place.

The value theory developed by the writer, as applied to teacher education, supports the ideal aim of the fullest realization of all persons through growth of the mind in study of the liberal arts and sciences as well as the development of emotional and social maturity through an atmosphere of trust, mutual understanding, and support in the classroom. The religious function of integrating all values into a meaningful philosophy of life should be attempted in all general education courses as well as in required philosophy courses. Religion as a field of study suggests elective courses in religion and philosophy of religion. Finally, the college or university should maintain a chaplain whose purpose is to work with voluntary student groups in study, work projects, and worship. The writer maintains that these religious implications are rooted in a defensible axiological system, and that their application would strengthen the democratic ideal of tax-supported education and provide adequately for religious pluralism as well as for deep religious convictions.

304 pages. \$3.90. Mic 56-2037

THE MISSIONARY CONTENT OF CONTEMPORARY AMERICAN THEOLOGY

(Publication No. 16,578)

William Thomas Ingram, Jr., Ph.D.
Vanderbilt University, 1956

Supervisor: Professor Nels F. S. Ferré

This study of "The Missionary Content of Contemporary American Theology" has begun with the year 1932, which was the year of the publication of *Re-thinking Missions*. The number of books devoted to the task of defining the theological basis for the missionary enterprise has been very few. Yet, topics fundamental to a theology of missions have been discussed in numerous articles contributed to scholarly religious journals, and, in many instances, reference has been made to the pertinence of these subjects to Christian missions. The writer has endeavored to review and evaluate this material. He has also studied fundamentalism, liberalism, and neo-orthodoxy with the purpose of determining their effect on the theology of missions. In addition, he has studied the missionary content of the theology of Nels F. S. Ferré and Paul Tillich on the grounds that these men represent theological positions not defined by the generally accepted types of theology, and that they have expressed definite interest in the missionary enterprise.

Some of the problems of missionary theology are found in these topics: the possibility of a universal religion; the uniqueness of Christianity; the Christian attitude toward non-Christian religions; and the motives of Christian missions.

Theological liberalism emerged victorious over controversial fundamentalism, only to be confronted with the revival of Kierkegaard and the impact of neo-orthodoxy. Liberals began the process of rethinking their positions in the light of the emphases of these positions and in the light of the challenges of a series of world crises. The process resulted in neo-liberalism, but the basic liberal emphasis on the principle of continuity was not abandoned. As a result, liberalism has not been able to arrive at any clear basis for the uniqueness of the Christian faith. The primary contribution of liberalism lies in its attitude toward non-Christian religions, which enables Christians to find a working basis for cooperative action with other religions in a common effort to overcome world secularism.

There has been a revitalization of fundamentalism by the emergence of a comparatively small group of broadly trained men who have maintained the basic tenets of fundamentalism. The fundamentalist basis for missions, however, has not been changed by this group. It has remained a Biblical literalism which requires obedience to divine command, a belief that all adherents of non-Christian religions are going to hell, and a completion of the preaching of the Gospel to the nations before the second coming of Christ.

American neo-orthodoxy has not applied its system of thought to the problems of missionary theology. The contribution of neo-orthodoxy lies in its influence on liberalism. Under its influence, many liberals have revised their doctrine of man to include a concept of the radical nature of man's sinfulness, and his need of salvation.

Nels F. S. Ferré has made a positive approach to the problems of missionary theology through his definition of

the doctrine that God is *agape*, and he has found the uniqueness of the Christian faith in his doctrine of discontinuity at the point of the Incarnation.

Paul Tillich has found the uniqueness of the Christian faith in his doctrine of the New Being. He has also contributed the categories of the latent and manifest churches. Paganism, Judaism, and humanism form the latent church. When Jesus is accepted as the Christ, the latent church becomes the manifest church. This actualizing of the latent church is the missionary task. (Tillich doubts the wisdom of changing the status of Judaism.)

A greater unanimity of thought on the problems of the theological basis for missions should be one of the goals of the ecumenical movement.

325 pages. \$4.20. Mic 56-2038

ESCHATOLOGY AND THE MISSION OF CHRISTIANITY (WITH SPECIAL EMPHASIS UPON CONTEMPORARY PROTESTANT THOUGHT)

(Publication No. 16,825)

Maynard Herman Strothmann, Ph.D.
Columbia University, 1956

The intention of this dissertation is to show that a fruitful field of study exists in the juxtaposition of the eschatology and the mission of Christianity and furthermore, that both sides of the study are most clearly defined and understood in so far as they are held closely together. There is no mission without a view of eschatology, and there is no genuine eschatology without a view of the mission. Contemporary Protestant thought which makes a definite and conscious connection between mission and eschatology supplies the substance of the inquiry.

Chapter I presents as briefly as possible the evidence of a close relation between "world-mission" and "world-end" in the Bible. In the Old Testament, eschatology is seen in terms of the purpose of Yahweh in calling Israel to a special missionary vocation. The New Testament presents a reassertion and a reshifting of the relation between the two poles of our study, and hence, a new emphasis upon both.

In Chapter II the history of the Church is surveyed in order to appraise the presence and absence of an explicit and conscious connection between mission and eschatology, and to set the stage for the consideration of more detailed contemporary thought on the subject. Three motives for the mission having some explicit eschatological character are suggested, namely: the apocalyptic, the progressivistic, and the ecclesiastical. The three subsequent chapters represent three emphases in contemporary thought which may be construed as readjustments respectively of these three eschatologically determined motives.

Chapter III, "The View of a Critical 'Mission-Time'," draws upon the views of Oscar Cullman, Karl Hartenstein, Walter Freytag, and Hendrik Kraemer. Present time is described as "end-time" eschatologically designated for the mission. Present time is "mission-time." The present, therefore, exists in a tension between a future "already fulfilled" and a future "not yet fulfilled." The provisional character of all human activity is emphasized.

Chapter IV, "The View of 'Progressive Evangelism',"

depends upon the thought of John Baillie and Kenneth Scott Latourette. The possibility of progress in the present time is considered. Some idea of progress derives from the definition of the present as a forward moving mission-time in which ultimate meaning is already in some way being realized. While affinity with the thought of the preceding chapter must be noted, the mission is given a more extended possibility at this point.

Chapter V, "The View of an 'Expectant Evangelism'," has its source in the writings of Max Warren and Alexander McLeish. Accepting much of the main thought of the previous chapters, this chapter emphasizes the implications of the expected fulfilment of the end for the mission of the Church as a "preparing community." There is a correlation between the mission of the Church and the fulfilment of the purpose of God. The instrumentality of that mission in the expected consummation is not without final ambiguity, and therefore, its work is described as that of "expectant evangelism."

The concluding chapter relates the thought of the three preceding chapters. The point of view is taken that the fullest development of the relationship between eschatology and mission involves all three emphases, and that by relating them in the order presented, the significance of the mutual relationship between mission and eschatology is brought out most clearly. The connection between the Christian mission and Christian eschatology provides a distinctive understanding of both the mission and the eschatology of Christianity. 275 pages. \$3.55. Mic 56-2039

THE GOSPELS-TEXT OF ATHANASIUS

(Publication No. 16,871)

Gerassimos Zervopoulos, Ph.D.
Boston University School of Theology, 1955

Major Professor: Dr. Edwin P. Booth

The subject of this study belongs to the general field of the Patristic studies; specifically, it is connected with the contribution of the Patristic quotations to the Textual Criticism of the New Testament and focuses on the text of the four Gospels as used by Athanasius.

The Gospel quotations found in Athanasius' printed writings as they appear in the Migne edition were collected and then collated against the Textus Receptus; then the textual variants have been analysed.

Before the collation process starts all of the additional material, such as, conjunctions, lectionary phrases etc., were taken out of the quotations. For the witnesses which support Athanasius' readings, the critical apparatuses of Legg, Tischendorf and von Soden have been consulted. For accuracy, the supporting witnesses of every single variant have been separately checked with a number of textual sources. The Athanasian Gospel quotations in Migne have been also checked with those found in Opitz's *Athanasius Werke*. This later work is incomplete (only nine parts are available thus far). Out of around 60 Gospel quotations compared, between these two editions only 4 variants have been spotted.

The following is the result of counting the total variants of Athanasius and their supporting witnesses:

1. Matthew, Variants: 105

Origen 48 or 45%

Aleph 31 or 28%

B 29 or 27%

.....

D 21 or 19%

Other minor witnesses

2. Luke, Variants: 59

Aleph 21 or 36%

B 21 or 36%

Origen 19 or 32%

.....

D 16 or 27%

Other minor witnesses

3. John, Variants: 74

B 36 or 47%

Aleph 35 or 46%

Origen 17 or 23%

.....

D 21 or 27%

Other minor witnesses

The text of Athanasius from Mark does not present any particular interest. His quotations from that Gospel are very limited and therefore not sufficient to explain the character of the text used.

The conclusion is that this study has verified the opinion of those textual critics of the past who predicted the Neutral character of the Athanasian Gospel-text.

217 pages. \$2.85. Mic 56-2040

SOCIAL PSYCHOLOGY

THE INFLUENCE OF RACIAL PREJUDICE ON SOCIOMETRIC CHOICES AND PERCEPTIONS

(Publication No. 16,905)

John Harvey Mann, Ph.D.
Columbia University, 1956

The study is concerned with the influence which the social norm of racial prejudice exerts on the sociometric choices and perceptions of individuals in small interracial groups.

The subjects of this inquiry were 78 students participating in a graduate course. Only Negro and white Christian students were used in the study. Each subject was randomly assigned to a six-man group. These groups met in leaderless group discussion four times a week over a three week period. Once during each week a Sociometric Perception Questionnaire was administered to each subject. In order to fill out the questionnaire the subject had to indicate his own sociometric friendship choices from among the group members and to predict the friendship choices of each other group member (indicating in this manner the nature of his sociometric perception). This data was then analyzed to test a series of hypotheses which had been formulated, on the basis of previous research, to describe the probable influence of prejudice on sociometric choices and perceptions.

From this analysis the following conclusions were drawn:

1. Individuals prefer to have as friends members of their own race.

2. Older whites prefer whites as friends more than older Negroes prefer Negroes.
3. The social preferences of persons who live in the North show greater similarity to members of their own race than the social preferences of persons who live in the South.
4. Whites are more aware of the social preferences of members of their own race than are Negroes.
5. Older Negroes are more aware of the social preferences of whites than older whites are of the social preferences of Negroes.
6. As the group members interact, the awareness which Negroes have of the social preferences of other Negroes increases more than the awareness which whites have of the social preferences of other whites.
7. As the group members interact, the similarity between the social preferences of Negroes increases more than the similarity between the social preferences of whites.

These findings, on the whole, supported the experimental hypotheses being tested by the study. It was concluded, therefore, that the social norm of racial prejudice does influence the sociometric choices and perceptions of individuals in small interracial groups.

70 pages. \$1.50. Mic 56-2041

SPEECH-THEATER

SPEECH-THEATER

SCHILLER'S DRAMATIC TECHNIQUE

(Publication No. 16,823)

John Rothman, Ph.D.
Columbia University, 1956

The widely divergent and often contradictory appraisals of Schiller's dramas and of the relative significance of his dramatic and philosophical works, which constitute the bulk of Schiller-literature, are unsatisfactory because they fail to afford a plausible, coherent view of Schiller's personality and work as a whole. This dissertation seeks to present such a view by analyzing the connection between Schiller's philosophy and his dramas, which is embodied in his dramatic technique.

Schiller believed firmly in the moral perfectibility of man and felt impelled to propagate this faith. With his genius for recreating the world as he saw it in terms of dramatic action, he inevitably turned to the theatre as his medium, rather than the pulpit or the pamphlet. It is the fusion of idealistic faith and dramatic genius, of philosophical didacticism and superb showmanship, that constitutes Schiller's dramatic technique. Schiller's plays do not merely convey his fervent message, they are built upon and oriented by it. The story, the characters, the setting, the diction, the individual incidents and stage devices, all the elements of drama are molded upon and adapted to the expression of the theme. Yet this expression is truly theatrical; the works remain dramatic actions of tremendous power on the stage. The enduring appeal of Schiller's plays thus lies both in the preachment they embody and in their intrinsic theatrical effectiveness.

Schiller defined his technique, as well as the philosophy he was preaching, in his essays. In discussing the tragic art, he limited severely the types of tragic conflicts suited to his purpose, stressing the guilt-expiation-redemption complex as the most favorable theme; in consequence, he imposed rigid requirements as to characterization, plot-construction, dialogue, and the other major elements of the drama. This was accomplished during the decade between the completion of *Don Carlos* and the ripening of the *Wallenstein*-project. The four plays preceding this period are discussed for their intrinsic interest as well as for the fact that they - especially *Die Räuber* and *Don Carlos* - indicate the direction in which the playwright was developing. *Wallenstein*, the first play completed after this period, shows important deviations from Schiller's theory, indicating the serious difficulties he faced in translating theory into practice. In *Maria Stuart* and *Die Jungfrau von Orleans*, Schiller showed complete mastery of his self-prescribed task, but in the latter play he varied the form in which the theme is dramatized. In *Die Braut von Messina* he attempted, unsuccessfully, to adapt the form of the Sophoclean fate-tragedy to his idealistic drama. His last completed play, *Wilhelm Tell*, diverges even further from his theory of tragedy, taking its orientation, rather, from

the definition of the "idyll" given in Schiller's essay "Über naive und sentimentalische Dichtung"; but here he achieved his best synthesis of philosophical and theatrical elements. Further supporting evidence for this interpretation is found in Schiller's fragmentary plays, and in his adaptations and translations of plays by other authors.

Analysis of each of the plays shows how Schiller combined the philosophical and theatrical elements, where and how the preachment enhances or detracts from the value of the work as a stage-play, and where and why Schiller achieved, or failed to achieve, theatrical effectiveness. Throughout, Schiller's work and particular techniques were influenced by his intimate association with professional theatres and theatre-people. He used dramatic and poetic devices which had proved their worth before on German stages as well as abroad, often with new effect and to new advantage. Transcending the limits of the drama proper, he did not hesitate to utilize other arts, especially lyric poetry, music, and painting, and devices of opera, pageantry, and other spectacles.

266 pages. \$3.45. Mic 56-2042

THOMAS HOLCROFT: PERFECTIBILITY'S PLAYWRIGHT

(Publication No. 16,864)

Alfred Oliver Wilkinson, Ph.D.
Stanford University, 1956

Thomas Holcroft rose industriously from poverty to write *The Road to Ruin*, one of the most popular comedies of the nineteenth century; *Anna St. Ives*, a novel illustrating the entire Godwinian doctrine of perfectibility a year before the publication of *Political Justice*; *A Tale of Mystery*, the first English melodrama. Holcroft was also the closest associate of the radical thinker William Godwin; friend of R. B. Sheridan, William Hazlitt, Charles Lamb, Crabb Robinson, Elizabeth Inchbald, the Kembles, and Thomas Paine. He has been credited, moreover, as a pioneer in employing the novel for purposes of radical indoctrination. But since it is generally believed that he avoided in his plays the expression of his radical political and social theories, his importance in theatre history has been generally discounted.

Certain facts concerning Holcroft and his plays, however, indicate a significant contribution to the development of social drama. Influenced by Godwin and heated by Revolutionary fervor, Holcroft dedicated himself to the task of eradicating error both in the individual and in society at large. In 1793 he said, "...it is the duty of all men to warn each other against error, in whatever manner, form, or place, it may exist; and this is peculiarly our duty, we having professedly made that our department in the general labours of society." It is not surprising, therefore, that not only his novels but also his plays written after his

acquaintance with Godwin are impregnated with the philosophy of perfectibilitarianism.

Proof that Holcroft employed his dramatic writing to express radicalism is found by closely examining his *Memoirs*, his critical writing, his novels, and all of his extant plays, including unpublished manuscripts in the Larpent Collection. One finds outspoken denunciations of the social order. Craig, the artist in *Love's Frailties*, for example, says, "I was bred to the most useless, and often the most worthless, of all professions; that of a gentleman." That Holcroft, for the most part, avoided open contentiousness in his plays is, however, admitted. The reformation which he and Godwin sought was to be achieved without resort to violence, the product of open contentiousness, because violence itself was Error. Hence Holcroft's perfectibilitarianism is usually reflected indirectly. In the structure of the dramatic actions themselves, therefore, important radical implications are also to be found. In these actions Holcroft substituted natural forces for what he deemed were the unnatural ones of constituted authority and that authority's chief ideological support, the myth of Christian orthodoxy. Thus Satan is often replaced by personalized abstractions of Error, i.e., Ignorance, and God, or at least His saints, by likewise personalized abstrac-

tions of Virtue, i.e., Understanding. Between Error and Virtue struggle the majority, who by necessity delight in being good even though frequently corrupted by habitual and sometimes impenetrable ignorance. In such plays as *The School for Arrogance*, *Love's Frailties*, and *Knave, or Not?*, Holcroft thus incorporated radical doctrine over half a century before Robertson's *Caste and Society*.

Holcroft's social drama remained only partially developed. Frustrated by the widespread reaction to the Revolution and the stigma of his imprisonment for treason in 1794, he strove to regain his lost popularity without, at the same time, compromising his ideals. The result was sometimes hack-work as in *The Force of Ridicule* and *The Old Cloathsman*, or apparent contradiction as in *Knave, or Not?*. The most significant result of his struggle against prejudice, however, was his retreat into romantic melodrama in *Deaf and Dumb*, *A Tale of Mystery*, and *The Lady of the Rock*, in which the compelling vigor of immediacy and specificity in correcting social evils is lost. This retreat, moreover, dictated by a triumphant conservatism, partly accounts for the delay in the development of a true social drama in England and on the Continent.

263 pages. \$3.40. Mic 56-2043

ZOOLOGY

THE RELATIVE SUSCEPTIBILITY OF THE VARIOUS DEVELOPMENTAL STAGES AND INSTARS OF THE RICE WEEVIL, *SITOPHILUS ORYZA* L., TO CERTAIN FUMIGANTS

(Publication No. 16,872)

Perry Lee Adkisson, Ph.D.
Kansas State College, 1956

In spite of the importance of fumigation as a means of controlling grain infesting pests, surprisingly little is known about the action of the common fumigants on the developmental stages of many stored grain insects. This study was undertaken to investigate the relative susceptibility of the stages of the rice weevil, *Sitophilus oryza* L., to carbon tetrachloride and ethylene dichloride.

Pawnee wheat was used as the culture medium; this grain was held at approximately 0° F. for several days to kill any incipient insect infestations. The moisture content was stabilized at 13.5 per cent, and the grain was stored and the experiments conducted in the rearing room at approximately 82° F.

Cultures were maintained in wide-mouthed, one-quart mason jars which contained approximately one-half inch of wheat. Two hundred active weevils were placed on this wheat and allowed to remain for a three-day oviposition period. New cultures were made every three days.

Samples of infested kernels were dissected and the immature forms present examined in order to accurately determine the stage in the grain to be treated. A random sample of this grain was then taken for use in a fumigation

test. Four replicates were made for each test with each replicate containing 250 kernels.

Adults approximately two weeks old were fumigated, both in a small grain mass (7.30 g) and without the grain mass, using analytical grades of carbon tetrachloride and ethylene dichloride.

Fumigations were conducted in the laboratory, using small-mouthed, one-gallon jars, averaging 3.915 liters in volume. As soon as the fumigant was introduced to the jar, it was sealed and stored in the rearing room (82° F.) for 24 hours. Mortality counts of the immature forms were made by a comparison of the number of adults emerging from the treatment and from the controls. Final adult mortality was determined seven days after the date of fumigation.

The tests were designed to obtain the LC₅₀ values for each fumigant to each stage. The data were plotted on curves according to the method of probit analysis and the curves were fitted by eye.

The LC₅₀ values for carbon tetrachloride indicated that the descending order of resistance of the various stages to this fumigant was pupae = eggs = fourth instar > third instar > pre-emergence adults > first instar = second instar > adults. The slopes of the lines suggested that the first and second larval instars were more sensitive to changes in dosages than were the other stages.

The LC₅₀ values for ethylene dichloride indicated that the descending order of resistance to this fumigant was third instar > egg = first instar = second instar > fourth instar = pupae = pre-emergence adults = adults. The slopes of the various curves suggested that eggs, first,

second, and third instars were more sensitive to changes in dosages than were the later stages.

Ethylene dichloride was considerably more toxic to all stages than was carbon tetrachloride. Furthermore, each stage did not react in a like manner to the two fumigants. For example, the third instar was most resistant to ethylene dichloride, whereas, the pupae, fourth instar, and egg were the most resistant stages to carbon tetrachloride. The adults were among the most susceptible stages to both fumigants. The early instars appeared to be more sensitive to both fumigants than were the later stages.

97 pages. \$1.50. Mic 56-2044

REPRODUCTIVE BEHAVIOR AND OVIPOSITION OF A
NOCTURNAL LEPIDOPTERON, HELIOTHIS ZEA
(BODDIE) AS AFFECTED BY VARIOUS
ENVIRONMENTAL FACTORS SUCH AS LIGHT,
COLOR, SURFACE TEXTURE, AND NUTRITION

(Publication No. 16,877)

Philip Serna Callahan, Ph.D.
Kansas State College, 1956

The corn earworm, Heliothis zea (Boddie) (Lepidoptera; Noctuidae), is an insect of considerable economic importance through the United States, injuring corn, cotton, and many other crops.

The emphasis of this work was placed on a study of the reproductive behavior of the adult moth as affected by certain environmental factors that might be related to the attractiveness of preferred host plants for oviposition. The factors studied included light, color, surface texture, and nutrition.

Larvae were reared in egg-crate type rearing trays and the pupae allowed to emerge in battery jars with villous cloth coverings. The behavior of the imagoes at emergence was described and the villous cloth surface found to be necessary for proper wing expansion. A comparison of length of life of mated and unmated imagoes, and of unmated imagoes in holders, indicated that mated imagoes live longer than unmated imagoes but that the inactive imagoes in holders live the longest. The activity of the imagoes at an intensity below 0.89 foot-candles was fairly constant throughout the night. Imagoes exposed to a sudden change from high intensity light to a low intensity light show an inactive time lag of 10 to 17 minutes, followed by high activity of from 17 to 45 minutes and activity of a lower pace for the remainder of the night.

The reproductive behavior of the imagoes was described. It was found that caged, reared female moths never mated more than once while the males mated up to three times. Females taken in the field from a black-light trap had mated up to five times. Copulation lasted for an hour to an hour and forty-five minutes, with an average of about 56 per cent of the reared females copulating. The sex ratio was 7 to 8 males per 10 females. Ovipositing females deposited their eggs on a cloth surface lighted by low intensity light in preference to their host plants.

The morphology of the male and female reproductive system was described. Studies on the relationship of fat bodies to eggs indicated that nonmated imagoes absorbed their eggs without chorion and retained the eggs with

chorion, while in mated imagoes, the number of eggs without chorion remained constant as the eggs with chorion were being deposited. No correlation could be found in a comparison of pupae weights with the percentage of adult feeding and length of life. Imagoes lived longer on food and accepted food a greater percentage of times than they accepted drink.

Tests on the response of the imago to differences in surface texture showed that villous surfaces were best suited to moths for maintaining a hold. Hirsute, strigose, or pilose surfaces tested lower, and glabrate surfaces very low.

Experiments on the reaction of the imago to various wave lengths of light showed that at equal intensities, there was no difference in response of the imago to 14 per cent polarized light and nonpolarized light. The higher response of the imago was always to the shorter of any two competing wave lengths, and the imagoes showed less response differences to competing wave lengths close together on the spectrum than to wave lengths further apart. The imagoes, after a time, became conditioned to blue, and the response built up to this color.

A discussion is given which relates the results of this research to the possible mechanisms of resistance to the insect in varieties of plants and to the control of the insect. The need for modifying varieties in regard to color and surface texture as a means of producing resistant varieties is pointed out. 160 pages. \$2.10. Mic 56-2045

SOME THYROID INFLUENCES FOLLOWING
DIETHYLSTILBESTROL TREATMENT IN
THE ADULT MALE RAT

(Publication No. 16,678)

Cyrus M. Greenberg, Ph.D.
Rutgers University, 1955

The protein anabolic action of estrogens as well as the role of the thyroid gland with respect to growth, protein metabolism and reproduction has received but limited attention in the literature. A further inquiry into the effects of the thyroid state on the degree and mechanisms of recovery following estrogen administration in the adult male rat was undertaken in view of recent investigations concerning the nutritional aspects of estrogen recovery alone.

Rats of the Long-Evans strain and weighing 250-300 gm. were housed in pairs in metabolism cages. A protein free or an 18% casein diet was fed for twenty days during which the animals were injected subcutaneously with 0.1 mg. diethylstilbestrol. The rats were then permitted to recover from the estrogen for twenty days on an 18% casein diet. During this time, either 0.5% thiouracil fed in the diet, 10 micrograms D,1-thyroxine injected subcutaneously or 2 micrograms 1-triiodothyronine injected subcutaneously was administered. Pair fed nontreated controls were run concurrently. Urine and fecal samples were collected daily and assayed as four day pools for nitrogen. All animals were sacrificed on the forty-first day and organ weights were taken. Liver and testes protein and fat analyses were made from desiccated samples.

Results of this investigation indicated that:

1. Animals recovering from the administration of

diethylstilbestrol and fed 0.5% thiouracil had less positive nitrogen balance values than were noted in either pair fed or ad libitum fed rats.

2. Significantly greater body weight gains occurred in prior-stilbene treated rats than in non-stilbene treated pair fed controls.
3. Thyroxine and triiodothyronine did not influence nitrogen balance or body weight recovery when paired feeding was employed. However, thyroid hormone enhanced body weight recovery in stilbestrol treated rats when compared to ad libitum fed controls.
4. Thiouracil caused an increase in total and relative liver protein as well as a decrease in liver lipids.
5. Thyroid hormone did not alter the testes organ weight, water concentration or protein concentration.

116 pages. \$1.50. Mic 56-2046

ECOLOGY AND POPULATION DYNAMICS OF THE
CALIFORNIA OAK MOTH, PHRYGANIDIA
CALIFORNICA PACKARD
(LEPIDOPTERA: DIOPTIDAE)

(Publication No. 16,844)

John Patrick Harville, Ph.D.
Stanford University, 1956

Chairman: Professor G. F. Ferris

For over half a century, the California Oak Moth has been recognized as a serious pest upon the oaks of central and southern California. Periodically, mass outbreaks of larvae have defoliated trees over wide areas. These epidemic infestations then have been followed by crash-declines in which the species virtually has disappeared. This pattern has been considered a classic illustration of cyclic population fluctuation, with natural enemies causing the crash-declines.

In 1945, a long-range autecological study of Phryganidia californica was begun at Stanford University, having as ultimate objective an analysis of the dynamics of these presumably cyclic population fluctuations. Phryganidia proved to be an ideal subject for such studies, due to certain biological peculiarities, and to the comparatively restricted extent of its associated biocoenosis.

This research depended primarily upon extensive field investigations, supplemented as necessary by laboratory rearings and experiments. The exposed habits of Phryganidia in all its stages facilitated development of field observation techniques which did not interfere with the normal interactions of organisms and environment. Of particular note, it was possible in the field to analyze causes of mortality of Phryganidia pupae without in any way disturbing the samples being studied.

From these investigations, the following major generalizations have been drawn, relating particularly to the population dynamics of the species:

Phryganidia overwinters in an actively feeding larval stage; therefore populations require oak foliage for food the year around.

Phryganidia populations tend to be highly localized, due in large part to the trial and error nature of behavior mechanisms.

Long range dispersal of Phryganidia is common, due to chance passive transport of larvae and adults.

Distribution of Phryganidia through space and time can best be compared to a shadow-pattern, in which the central umbra represents indefinitely sustained populations, while the peripheral penumbra represents populations which are successful for only limited periods of time.

Exhaustion of the available food supply is the most common biotic cause of mass mortality in Phryganidia populations.

Natural enemies are not usually the cause of crash-declines of Phryganidia populations. Their total induced mortality rarely reaches 90%, and would have to exceed 99% to achieve effective control.

Phryganidia is not subject to predation by birds, apparently due to its unpalatability.

If general insecticides are used, man's efforts at chemical control of Phryganidia may backfire, destroying natural enemies which otherwise might serve as allies in controlling the host.

Crash-declines of Phryganidia populations in central California usually are due to density-independent factors associated with the occasional severity of winter weather. In all probability these are highly complex, involving the interaction of temperature, air movements, and relative humidity, with the age and previous activity of Phryganidia larvae.

The dynamics of population growth and decline appear to vary greatly over the geographic range of Phryganidia californica. In southern California, populations appear to fluctuate only moderately, being maintained in comparative equilibrium in an essentially benign physical environment. In central California, population fluctuations are much more violent, being characterized by rapid buildup and catastrophic crash-declines. Every outbreak in this zone essentially constitutes a new invasion of the territory, temporarily free from major biotic checks upon population growth, and under generally benign physical conditions. Buildups of population strength accordingly are extremely rapid, often progressing for several years. However, before any sort of biotic equilibrium can be established, these populations are destroyed by the periodic severity of winter climate. In northern California, winter climate always is too severe to allow populations to survive, although occasional summer colonies may become established temporarily as result of passive transport of larvae or adults to suitable food trees.

86 pages. \$1.50. Mic 56-2047

THE DISTRIBUTION AND EXCRETION OF P³² LABELLED DIAZINON IN GUINEA PIGS

(Publication No. 16,879)

John Nicholas Kaplanis, Ph.D.
Kansas State College, 1956

Purpose of Study

Availability of P³² labelled Diazinon made it possible to explore the fate of this potentially chemotherapeutic agent in male guinea pigs.

In this study, the following determinations were made and reported herein: (a) chromatographic techniques for the detection and separation of Diazinon from its intermediates, (b) tissue distribution of the labelled insecticide within the guinea pigs at different time increments, (c) excretion studies over a seven day period and analysis of those pigs at the end of this period for P³² residues, (d) qualitative studies for Diazinon in the urine, feces, and certain tissues or organs.

Materials

Chemicals. Besides radioactive Diazinon, a technical Diazinon, a pyrimidol compound obtained from the Geigy Corporation, and O,O-diethyl chlorothiophosphate labelled with P³² were used in paper chromatography studies.

Methods

Administration of Radioactive Compound. Two routes of administration were used—orally and subcutaneously. Peanut oil solutions of the radioactive labelled Diazinon were used in both routes.

Chromatography Experiments. A water-alcohol solvent (mobile polar phase), and vaseline (stationary apolar phase) constituted one system. Purified Skelly-Solve B and acetic acid (mobile apolar phase) and Carbowax 4000 (stationary polar phase) constituted the other.

Tissue Distribution Experiments. Administration of the labelled compound. Guinea pigs were treated at an average rate of 45 mg./kg. of body weight to determine the distribution of the insecticide or its metabolites.

Dissection of Pigs. The animals were sacrificed at 2, 4, 8, and 16 hours after treatment. The weights of the dissected tissues were immediately determined on a torsion balance. The tissues were wet digested after weighing.

Excretion Experiments. Two pigs were treated orally and two subcutaneously. Their urine and feces were collected periodically up to seven days. The pigs were sacrificed at seven days to determine the presence of P³² residue.

Qualitative Experiments. Two pigs treated orally were sacrificed three hours after treatment. The urine, feces, blood, liver, and contents of the digestive tract were extracted with ether and/or chloroform. Microquantities were introduced to vaseline coated strips and their R_f values determined radiometrically.

SUMMARY OF FINDINGS

The R_f values by visual and/or radiometric inspection for the P³² labelled Diazinon, technical Diazinon, pyrimidol

compound and P³² labelled O,O-diethyl-chlorothiophosphate were 0.860, 0.864, 0.481, and 0.845, respectively, using the stationary polar phase, and 0.427, 0.414, 0.743, respectively, using the stationary apolar phase. The diethyl chlorothiophosphate did not respond to color development but gave an R_f of 0.736 when determined radiometrically.

The internal distribution studies of P³² labelled Diazinon were studied at 2, 4, 8, and 16 hours after treatment. Of the tissues dissected and assayed radiometrically from the orally treated animals, the digestive tract proper, liver, and kidney had the greatest specific activity (cpm/g). In the subcutaneously treated animals, the liver, cecum, and kidney had the greatest specific activity. The blood accumulated small amounts of radioactivity by both routes.

The initial rate of excretion was most rapid among the orally treated animals.

The maximum elimination of P³² in the feces occurred within the first day with seven per cent of the total dose accounted for from the orally treated animals. The P³² evacuated by the injected animals was small, and it wasn't until the sixth day that 0.005 per cent of the administered dose was eliminated.

The residue present in the animals at the end of the seven day period was three times greater in the case of the injected animals.

In the qualitative investigation, only the blood, stomach, and small intestine of the orally treated animals distinctly showed unmetabolized Diazinon.

68 pages. \$1.50. Mic 56-2048

THE EFFECTS OF ACID STRIP MINE POLLUTION ON THE ECOLOGY OF A CENTRAL MISSOURI STREAM

(Publication No. 16,786)

John David Parsons, Ph.D.
University of Missouri, 1956

Supervisor: Robert Seymour Campbell

A study of the effects of acid coal mine pollution on the ecology of a Central Missouri stream was conducted from June 1952 through August 1954. Bottom fauna and plankton populations were sampled monthly from July 1952 through October 1953; water samples for chemical analysis were collected monthly throughout the entire 27 month study period.

Two aspects of pollution were found; the upstream area of the stream was continually polluted and the downstream area was periodically polluted by excessive flows of acid mine water.

To evaluate the effects of an excessive acid flow, the characteristic chemical and physical conditions and biological populations were determined. The degree to which the downstream area was polluted depended upon both the concentrations of effluents and the volume of flow.

The characteristic chemistry of the continually polluted area was apparently little affected by such a flow. The nonpolluted area was affected as follows: (1) the natural bicarbonate buffer system was destroyed, (2) there was a slight lowering in the dissolved oxygen content, and (3) there was an increase in the ions associated with the

discharge of acid mine water; namely, aluminum, calcium, magnesium, zinc, lead, sulfate, copper, hydrogen-ion concentration, and titratable acid. However, in final analysis, it appeared that the toxic agent of an excessive acid flow was the acid content of the water, measured as pH and as titratable acid.

The most apparent effect of an excessive acid flow in the nonpolluted area was the precipitation of silt, resulting in clear water of an "apparent" blue color.

Apparently, neither plankton nor benthos populations of the continually polluted area were affected by excessive acid flows. In general, the relatively large populations of this area were not unlike the large populations found in septic zones of organic pollution.

The plankton population of the nonpolluted area was drastically reduced by excessive acid flows. The remaining population was composed entirely of rotifers.

Because the variable occurrence of excessive acid flows into the nonpolluted area coincided with the time of emergence of most benthic species, it was impossible to measure the effects of acid mine pollution on the benthos. However, there were indications that a shift in the populations

had occurred which could be traced to changes in the severity of acid mine effluents.

Fishes were restricted to the nonpolluted area; here, an excessive acid flow with a pH of approximately 4.0 and titratable acidity of approximately 100 ppm was fatal.

A study of the limnology of acid strip mine lakes which contributed to the periodic pollution was conducted from September 1953 through August 1954. Physical data were limited to water temperatures. Titratable acid, sulfate, hydrogen-ion concentration, ferric iron, ferrous iron, copper, zinc, aluminum, calcium, magnesium, lead, and phosphorus were assayed.

Two types of lakes were studied: (1) red lakes, colored by the reddish-black oxides of iron, and (2) blue lakes, colored by reflection in the absence of turbidity. It appears that the reddish-black oxides of iron played a major role in the thermal stratification of red strip mine lakes. The blue lakes lacked turbidity of any type, and they remained homothermous.

Concentrations of sulfate salts increased progressively from surface to bottom; density and viscosity of the water increased accordingly in both types of lakes.

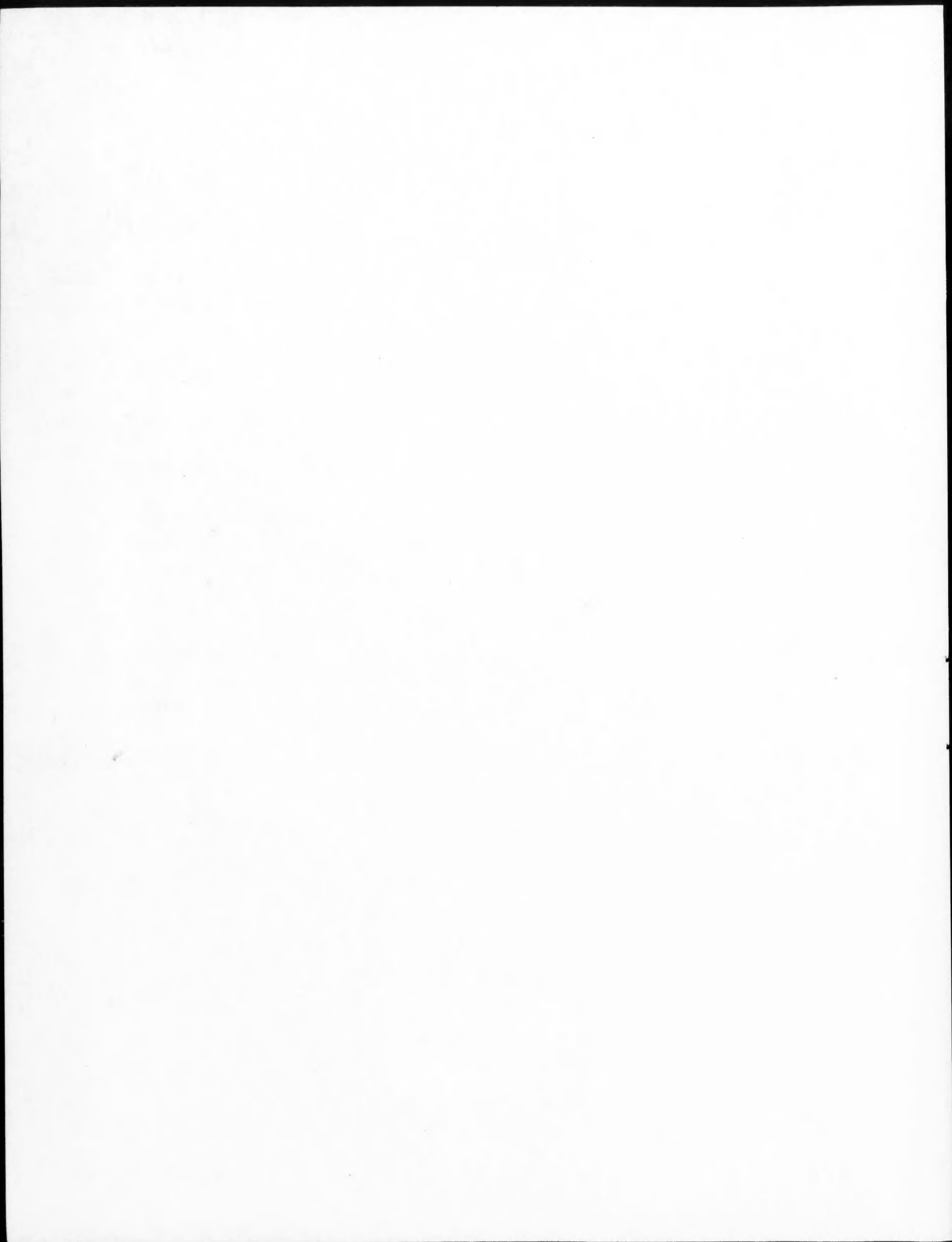
198 pages. \$2.50. Mic 56-2049

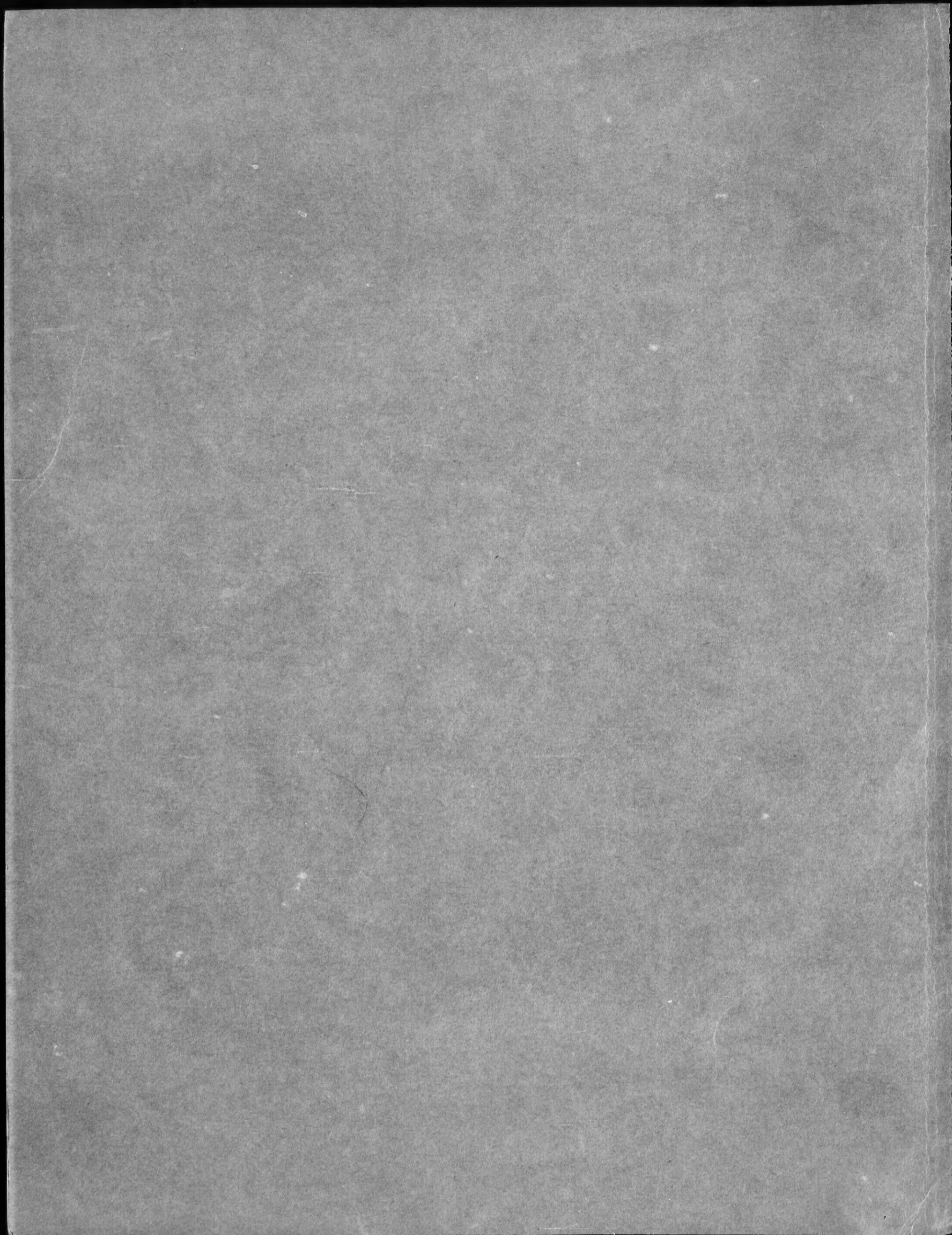
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